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## MEETING OF MARITIME LAW ASSOCIATION.

The annual meeting of the Maritime Law Association of the United States was held at the Association of the Bar in New York on May 4. There were present at the meeting Mr. R. D. Benedict, Hon. Addison Brown, Messrs. George B. Adams, Charles C. Burlingham, E. B. Conners, Frederic Dodge, Robert H. Hughes, J. Parker Kirlin, H. Pillans, Harrington Putnam, Julian B. Shope, Lorenzo Ullo, H. G. Ward and Franklin A. Wilcox. The following officers were re-elected: Robert D. Benedict, president; H. G. Ward, secretary; Harrington Putnam, Frederic Dodge, Henry G. Ward and Robert D. Benedict, executive committee. Robert D. Benedict and Joseph H. Choate were elected delegates to the Paris conference to be held October 1, 2 and 3 next and the president and secretary were authorized to select three other delegates.

The meeting then took up for consideration the questions to be discussed at the Paris conference. In respect to the liability of ship owners it was resolved that the limit should cover: First, the damage done to dykes, quays and similar fixed objects; second, maritime torts occurring without the privity or knowledge of ship owners and maritime contracts which are to be performed by the master and crew or which are entered into by a master in his capacity as such; and third, that it should not cover payment of wages of master and crew.

On the subject of salvage it was resolved that it is not advisable to regulate salvage in one uniform manner by legislation in the different countries, because the principles prevailing are so nearly alike that no regulation is thought to be necessary. It was resolved not to consider what may be the best rules to be adopted by such legislation, or on what basis the remuneration should be fixed; or by whom the remuneration should be payable; or to whom the remuneration is due; or whether a contract made at time of imminent peril is to be rescinded ipso facto or according to the circumstances of the case.

Upon the subject of obligation to afford assistance it was resolved that it should be made obligatory upon ships which have been in collision to assist each other so far as practicable; and that it is not advisable to create the same obligation in cases other than collision; and that the penalty for not standing by should be to create a rebuttable presumption of fault, fine or imprisonment or temporary revocation of license. It was resolved that jurisdiction should be exercised by the courts of the place in which the colliding vessel may be found, or wherever service can be made upon the ship owner, subject to the right to decline jurisdiction where both parties are non-residents.

The meeting then took up for consideration the subjects suggested in the notice of the meeting prepared by the executive committee. It was resolved that the subject of preliminary acts in collision suits should be referred to a sub-committee of three with directions to report at the next meeting of the association. The president appointed as the committee Mr. Putnam, Judge Brown and Mr. Dodge.

In respect to the proposed revision of the Revised Statutes of the United States transferring the jurisdiction of the circuit courts to the district courts, the association places itself on record as opposed to the pending revision of the statutes of the United States concerning the organization and jurisdiction of the courts of the United States, because the pressure of business upon many of the district courts would under that revision be largely increased, while the practical withdrawal of a number of the circuit judges from that business to sit exclusively on appeal would lessen the judicial force dealing with matters of original jurisdiction, which is now too small; and moreover, because the arrangement proposed by that revision would tend to lessen in the district courts the distinctive character which they hold as courts of original admiralty jurisdiction, which has had a most powerful influence in giving to the American admiralty its high standing in the jurisprudence of the world. It was also resolved that appeals from the district court to the circuit court of appeals should be heard before not less than three judges, particularly in admiralty cases.

The association also resolved that a uniform supply and material lien law be passed by congress. A committee consisting of Messrs. Hughes, Dodge and Kirlin was appointed to draft such a bill and present it at the next meeting of the association. The bill introduced by Senator Hoar in 1885 and reported by Senator Evarts in 1886 "to permit the owners of certain vessels and the owners or underwriters of cargo laden thereon to sue the United States" was recommended for passage. It was recommended also that congress should enact a law conferring a right of action for loss of life caused by negligence at sea, and Messrs. Mynderse, Taft and George B. Adams were appointed a committee to draft such a bill.

## FREIGHTS ON THE GREAT LAKES.

Aside from some chartering of vessel capacity for fall shipments of grain from Duluth to Buffalo, there is nothing of special interest in the lake freight market. Quite a large amount of Duluth grain has been covered for fall shipment. The rate first paid was 4 cents, but later it dropped to 3½ cents. It can not be learned that there is any more of this grain on the market. It has been well said that too much significance should not attach to current wild rates on ore, since very little tonnage is offered and little is required, on account of the equivalent of last year's output having been provided for in season charters. Rates prevailing for the very few wild charters that are being made are \$1 from the head of the lakes, 90 cents from Marquette and 70 cents from Escanaba. The rates on soft coal established at the opening of the season—50 cents to the head of Lake Superior and 65 cents to Milwaukee—are still upheld, with a heavy coal movement now, as the receipts at Lake Erie ports have been steadily increasing so as to provide for practically all the vessels that are offered.

## REAR ADMIRAL HICHBORN ON LEVIATHANS.

When it was recently announced in the newspapers that the North German Lloyd line contemplated the construction of a boat 754 feet in length, and having an engine power of 45,000, Rear Admiral Hichborn, chief constructor of the navy, was approached for an interview upon the subject. The boat is not to be 754 feet long; her total length will be about 706 feet, but nevertheless the remarks of the chief constructor are of interest. He said:

"It is entirely possible and practicable to build a ship of the dimensions and speed proposed, but it is a matter of question as to whether it would be a profitable investment or not. My judgment is that it would not be. It seems to me to be an identical problem with that of keeping a racehorse. According to her projected dimensions she will be by far the most powerful vessel ever built by any line, and her proposed speed of 25 knots, if realized, is greater than has ever been attempted for continuous sea speed, and quite equal to the speed attained by the United States cruiser Minneapolis on a four hours' trial trip. It is recognized, however, that the latter could not maintain that speed across the ocean, and the new steamer proposed by the German line would, therefore, excel the Minneapolis in point of endurance. The proposed horse-power will call for the consumption of about 1,200 tons of coal a day when under steam or fifty tons an hour. In building these huge, high-powered ships, the commercial question whether or not they will pay seems to be the principal one to be considered, and it is difficult, if not impossible, to see how this question can be answered by the proposed ship. The increase in power from the most powerful engines now afloat calls for an additional expenditure of about 240 tons of coal each day. That is only one item of the vast list of expenses attached to the running of great steamers, to say nothing of the original cost of the machinery to be installed, which would be at least one-half greater. The ship must also be built proportionately stronger to resist the extraordinary strain of its powerful machinery. There seems to be little doubt that the limit of size of ocean-going vessels is still a long way off, and a steamship 1,000 feet long may and, in my mind, undoubtedly will be launched in time to come. It would seem, however, that we are pretty close to the limit of the power that can be safely transmitted to two propellers. The indications are that a further increase of power will call for a proportionate increase in the number of propellers to keep the shafts within a reasonable size."

## CHIEF HYDROGRAPHER SUSPENDED.

Commander Chapman C. Todd, chief hydrographer of the navy, has been suspended from duty by Secretary Long, pending an investigation by the department into a charge that he had endeavored to influence the action of congress in a matter affecting the naval service. Representative Cannon of Illinois, chairman of the committee on appropriations, is the moving spirit in the allegation affecting Commander Todd. It is probable that Commander Todd will ask for a court of inquiry.

The suspension of Commander Todd grew out of the controversy in congress over the reduction by the house committee on appropriations of the appropriation for surveys to be conducted by the navy and the refusal of the committee to agree to turn over the surveys of the insular possessions of the United States to the naval service. A great many telegrams and letters were received by the committee from commercial bodies praising the work of the naval hydrographic office and urging that the coast survey be transferred to the navy department. Chairman Cannon, by direction of the committee, called on the secretary of the navy for a statement whether the navy department had instigated these communications from commercial bodies, and asking out of what appropriation the telegraphic tolls on them had been paid.

This call of the committee was referred to the bureau of equipment which called on the hydrographic office, one of its branches, for any information which it possessed on the subject. The navy department's answer was prepared and sent, the department denying any knowledge of any influence on its part on commercial bodies. Chairman Cannon then called on the secretary of the navy to know why the committee had not been furnished with a copy of a circular addressed by Commander Todd to officers in charge of branch hydrographic offices, telling them of the reduction in the appropriation for hydrographic work and to secure the co-operation of commercial bodies to prevent a reduction. Secretary Long then called on Commander Todd for an explanation. It is understood that he admitted writing the circular letter, but maintained, in explaining why he had not informed the department about it, that it was a private communication to his own subordinates, designed to prevent an injustice being done to the navy. On Commander Todd's own statement the order of suspension was issued.

Commander Todd is one of the best known officers of the navy. He commanded the gunboat Wilmington in the Spanish-American war and was in charge of the operations at Cardenas in May, 1898, in which Ensign Worth Bagley and some enlisted men of the torpedo boat Winslow were killed. After the war he made a notable cruise in the Wilmington up the Amazon river, penetrating to regions where no foreign vessel had ever been. On that trip he secured many rare animals and birds, which were presented to the National Zoological Park. Commander Todd is a Kentuckian and a relative of Rear Admiral Watson.

A first-class armored cruiser, the Aboukir, for the British navy, was launched a few days ago at the works of the Fairfield company on the Clyde. The new vessel is 440 feet in length and has a displacement of 12,000 tons. Her engines are expected to develop 21,000 horse power under natural draft, and her guaranteed speed is 21 knots per hour. She is fitted with thirty Belleville boilers, and her armor plates are of specially hardened steel. She will carry a crew of 750.



## DRAINAGE CANAL DIFFICULTIES.

INTERESTING HEARING OF VESSEL INTERESTS AND CHICAGO REPRESENTATIVES  
BY THE SECRETARY OF WAR—STRONG ARGUMENTS MADE BY MESSRS.  
FIRTH AND GOULDER—DISTRICT ENGINEER WILL PROBABLY  
BE INSTRUCTED TO REGULATE FLOW OF WATER  
THROUGH CHICAGO RIVER.

The special committee of the Lake Carriers' Association, consisting of ex-President Frank J. Firth, President W. C. Farrington, Counsel Harvey D. Goulder and others, was very courteously received by Secretary of War Root last week when they appealed to him to protect the vessel interests in the Chicago river, which have been put in jeopardy by the excessive current caused by the opening of the Chicago drainage canal. The trustees of the drainage canal were represented by Hon. William M. Springer. In a simple and lucid manner ex-President Firth presented the case of the vessel men:

"The Chicago drainage canal," he said to Mr. Root, "was opened under a conditional order from your predecessor, in which he reserved the right to close the canal or modify its operation in any way he saw fit, provided it interfered with the interests of navigation. It was opened in January after navigation for that year closed, and immediately vessels entered the river this year troubles began. They found, in the first place, a lower level in the water in the river over the tunnels; and they found the current flowing in the reverse direction. You understand that the current had flowed from the river into the lake and now flows from the lake into the river. They found the trustees experimenting with the flow, occasionally causing currents in one direction and occasionally in another. It became very necessary to have more tug service. Our agents reported that our vessels were moved in the river at a cost for tugs alone considerably over the previous year, besides other delays and troubles. Many vessels were caught above the tunnels by the reduced water in the river and had to lie there for considerable periods until the trustees shut down the gates, and it took hours after shutting the gates, according to the rise of the river, before the vessels were enabled to proceed.

"When our committee was appointed courtesy required that we should go to Chicago and have an interview with the trustees and the mayor, who, we knew, were equally interested with us in securing proper navigation of the Chicago river. We found them courteous and desirous of doing something, but clearly not knowing what to say. They were also embarrassed by the statute of Illinois which requires them to carry through the canal 20,000 cubic feet of water per minute for each 100,000 of population in the district, and the district now having about 1,800,000 people, the trustees were obligated under the Illinois statute to carry through the river 360,000 cubic feet a minute. That was the minimum amount provided by the statutes, and only through some higher power than the state of Illinois can that statute be violated. Our impression is that they will be glad to have you issue an order that will place the matter under the direction of your engineer in charge without any reference, for the time being, to the requirement of the Illinois law, so that we do not appear here in antagonism to the trustees, but co-operating with them in the endeavor that you shall, for the time being, take care of this navigation interest until they can complete the work on the river.

"The facts are that before running any water into that canal at all they should have removed the center piers where the river was bridged and they should have lowered the tunnels and straightened and widened the river. All that work, necessary to the whole scheme, was put off in the hope of giving the city the relief that it clearly needed, and this is the whole story."

Mr. Harvey D. Goulder, counsel for the Lake Carriers' Association, read for the information of the secretary of war the following section of the act under which the canal was constructed:

"That if at any time it has become apparent that the current created by such drainage works in the south and main branches of Chicago river be unreasonably obstructive to navigation or injurious to property, the secretary of war reserves the right to close said discharge through said channel or to modify it to such extent as may be demanded by navigation and property interests along said Chicago river and its south branch."

Mr. Goulder contended that the statute in reserving the power in the secretary of war to interfere did so in order that action might be had quickly—a thing which would upon its face be impossible were congress to be appealed to.

"A temporary condition should receive temporary treatment," said Mr. Goulder. "That the condition is bad is recognized by everyone; that the water has been lowered; that there are irregular currents; that these currents are not only irregular in direction, that is, as being reversed by the action of the drainage works, but they are irregular in this—that there are many center piers; there are abutments which project somewhat into the river; there are crooks and turns and irregular projections from the banks—all these when the current is swift cause it to shoot out and make many curved currents. It is true that where steamers heretofore have been handled with one tug, the character of these currents and the sudden effect of the side currents in going through the draws of bridges, requires them to have two. Where vessels were berthed without a tug they have since required at least one. Heretofore where a steamer was not going any great distance and would not have to turn around a bend in the river very many of the steamers were handled without tugs at all. Now they do not dare to move, especially with the current, a very short distance, even 500 or 600 feet, without having a tug. These conditions exist. Nobody questions them. They exist because the flow of water there is greater than the condition of the Chicago river admits of its being with safety and convenience to navigation.

"What we want, and what we are here for, is that some action be taken by the secretary after the briefest necessary time to inform yourself through your own channels, of the exact conditions and what is necessary to ameliorate them to a reasonable extent. It ought not to be taken that the mischief arises now from the total flow of 360,000 cubic feet because it may not be more than half that much. It certainly is not represented by anybody to be as much as that, and we think it ought to be first known what quantity if going through and causing this mischief as the predicate to an order as to how much water may flow through without damage, and we recognize that in your department you have the means of finding that out. These gentlemen are here from the layman's stand-

point, not the engineer's, to impress upon you what the conditions are, which, from their standpoint, require that the secretary of war should make as promptly as possible the necessary investigation and then take some action."

Hon. William M. Springer, representing the trustees of the Chicago drainage canal, urged that the matter be referred to Major Willard, government engineer at Chicago, with instructions that he investigate and report the facts to the secretary of war at the earliest possible moment. "So far as that you issue a restraining order at once, is concerned," said Judge Springer, "I trust you will not do that until you have had an opportunity to investigate. The board of trustees of the district will not object to a speedy investigation. In fact the earliest that you can possibly have they will not object to."

"I think the restraining order that we are asking for need not await any investigation," said Mr. Firth. "I do not think that the trustees of the sanitary district desire that it shall await any investigation. We simply ask that an order be issued that will enable Major Willard to say to the sanitary district that the flow of water through the canal shall be restricted so much or to such times as he may prescribe after consulting with the trustees and the representatives of the lake vessels."

Mr. L. E. McGann, representing the mayor of Chicago, said: "While the statement made in reference to the effect of the opening of the canal is very conservative and objected to by no one—I believe it to be a very careful conservative statement—there are circumstances that should be laid before you with reference to the position of the city of Chicago in the matter. The work being performed was primarily for the benefit of the city of Chicago for sanitary purposes. The opening of the canal, as was stated, may have been premature. The work of the sanitary trustees is now in progress. The plans originally made have not been fully executed. The premature opening of the canal is an incident that is appreciated by every citizen of Chicago. If incidentally thereto certain interests may have been affected, we regret, and I do not think there is a citizen in Chicago who will object to the authorities, the sanitary trustees, the government of the city of Chicago and such others as may have the right to, determining what is the proper course to pursue. I say I do not think there is a citizen of Chicago who would object to such regulation pending the execution of the plans originally made, and I assume the plans are made in accordance with the law of the state and they shall conserve and preserve all of the interests that existed prior to the inauguration of that work. These interests of navigation shall not suffer. The municipality recognizes in the navigation interests of the city one of its most valuable rights and properties. Certainly it is more interested than any gentleman present—I mean personally interested or representing interests—but there is no interest as great as the interests of the city of Chicago, the corporation of Chicago, in preserving intact the conditions that existed prior to the opening of the sanitary canal. They do not want to increase the cost of navigation in the Chicago river nor keep away one keel. I wish to state that so far as the interest of Chicago is concerned at the very earliest possible moment the secretary of war, with the sanitary trustees and the city of Chicago, if they are to be considered, should give at least temporary relief to the navigation interests."

"Ours is the paramount interest," said Mr. Goulder; "paramount in the law and so recognized. These people started without having completed their progress. They are operating under a law which requires them to use a minimum flow for the completed work. We do not ask a definite, final, formal code of rules and regulations applying to this canal. We do not ask for rules which should stand for the next twenty or fifty years or any definite time as the codified law of the operation of this canal. We simply ask you to meet this exigency by temporary relief which they cannot give us up there."

"I do not think that an order should be issued," said Judge Springer, "until an investigation has been had as to the conditions which exist."

"To what conditions do you refer?" asked Mr. Goulder.

"You have stated," replied Judge Springer, "that the flow of water was so great that it interfered with navigation; greater cost for the use of tugs and the difficulty of getting ships into the channel."

"Your board admits that is true," responded Mr. Goulder.

"I do not know whether it is true or not," replied the judge. "You have stated it and I do not deny it. I presume it is true."

"I would like to ask a question," said Secretary Root, "of the representative of the trustees of the sanitary district and the representative of the city of Chicago whether it has become apparent that the current created by the drainage works in the south and main branches of the Chicago river is unreasonably obstructive to navigation or injurious to property."

"I will answer that it is obstructive," said Mr. McGann, "and I answer not only as the representative of the mayor of Chicago but as the proper officer representing the city of Chicago whose duty it is to supervise the navigation of the Chicago river."

"I object to the word unreasonable," interposed Judge Springer. "There may be some interference and some difference of conditions but whether it is an unreasonable condition I am not prepared to say."

"Then you say that the current is obstructive to navigation and injurious to property?" interrogated Secretary Root.

"I cannot say that," replied the judge. "I assume, of course, that a swift current is more difficult to navigate than a slow current. I simply know that as anyone would know it. But whether it is so swift as to make navigation dangerous I am not prepared to state."

"Are you not prepared to state because you have no personal knowledge?" asked the secretary.

"I have no personal knowledge."

"Have you received any instructions from your clients on that point?" queried the secretary.

"They have not informed me on that point. They simply ask that before any action be taken the matter should be referred to the engineer for investigation."

"I do not think," said Secretary Root, "that there should be any extended investigation as to facts that are not controverted. Mr. Springer, will you be kind enough to advise the trustees of the Chicago sanitary district that if they controvert the statement that the current created by the drainage works in the south and main branches of the Chicago river is unreasonably obstructive to navigation or injurious to property, they will be given the remainder of this week to communicate to the secretary of war any contention upon that subject which they choose to present."



I think, if they concede that fact, it is for the interests of all concerned that they should say so. If they controvert it they should present such facts controverting it as they see fit. The petition of the vessel interests and other papers will go in ordinary course to the chief of engineers with instructions to send them to the engineer in charge, Major Willard, and direct him to report without delay what regulation will be effective to accomplish the object stated in the petition, that is, what regulation will operate to require the board of trustees of the sanitary district to so control and restrict the flow of the waters as to prevent them for the time being from becoming destructive to navigation or injurious to property. That is subject to the trustees of the sanitary district successfully controverting the statement of facts which I have asked you to call to their attention."

"In view of the fact," said Mr. Goulder, "that in all human probability they will not ask an opportunity to controvert it, from what they said to us—"

"As this is a matter of common interests," interrupted the secretary, "they should wire me or Mr. Springer if they do not."

"In view of that probability," said Mr. Goulder, "may we ask that instead of taking the ordinary routine, if there is some way that these papers—"

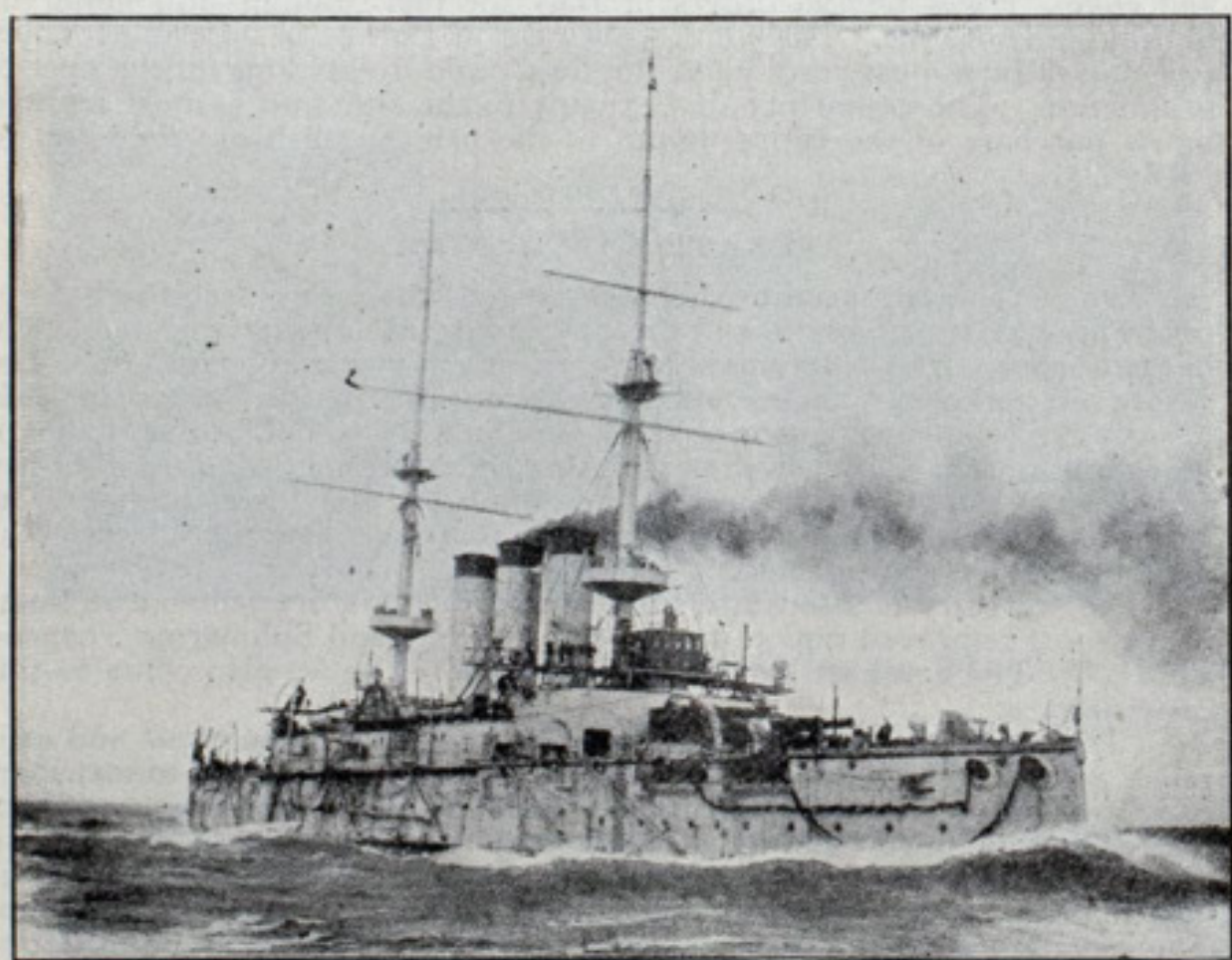
"They will go immediately," answered Mr. Root. "I shall not wait for that. I do not intend that there shall be any long investigation."

Major Willard is now conducting his investigation and will make his report to the secretary of war at the earliest possible moment.

#### JAPANESE BATTLESHIP SHIKISHIMA.

The Japanese battleship Shikishima, built in England, is now probably in Japan, as she has had full time to make the voyage since leaving the hands of her builders. In general constructive details the Shikishima follows the usual methods employed for ships of this class in the British navy. She is built on the usual bracket-frame system with wing passages on each side to be used for holding coal. She has a double bottom amidships with watertight flats at the ends of the vessel, thus having practically a double bottom from end to end. The general dimensions are: Length over all, 438 feet; length between perpendiculars, 400 feet; breadth, extreme, 75 feet 6 inches; depth, top of keel to upper deck, 45 feet 2½ inches; draught of water, mean, 27 feet 3 inches; displacement at that depth, 14,850 tons.

The armor is of Harveyized nickel steel. The side protection consists of a belt which extends from stem to stern. The belt is 8 feet 2 inches in maximum depth. It is 9 inches thick amidships, and tapers to 4 inches thick at the ends. It has a vertical extension of 5 feet 6 inches below the water line, and 2 feet 8 inches above at the designed load draught. Above this belt and carried to the height of the main deck, there is side armor 6 inches thick for a length of 250 feet with screen bulkheads at ends, also 6 inches thick, forming a complete armored citadel, thus extending longitudinally over the space between the two barbets. Between the armor deck and the belt deck, there are 12-inch screen bulkheads, which join the barbets to the side armor. The armored deck is arranged



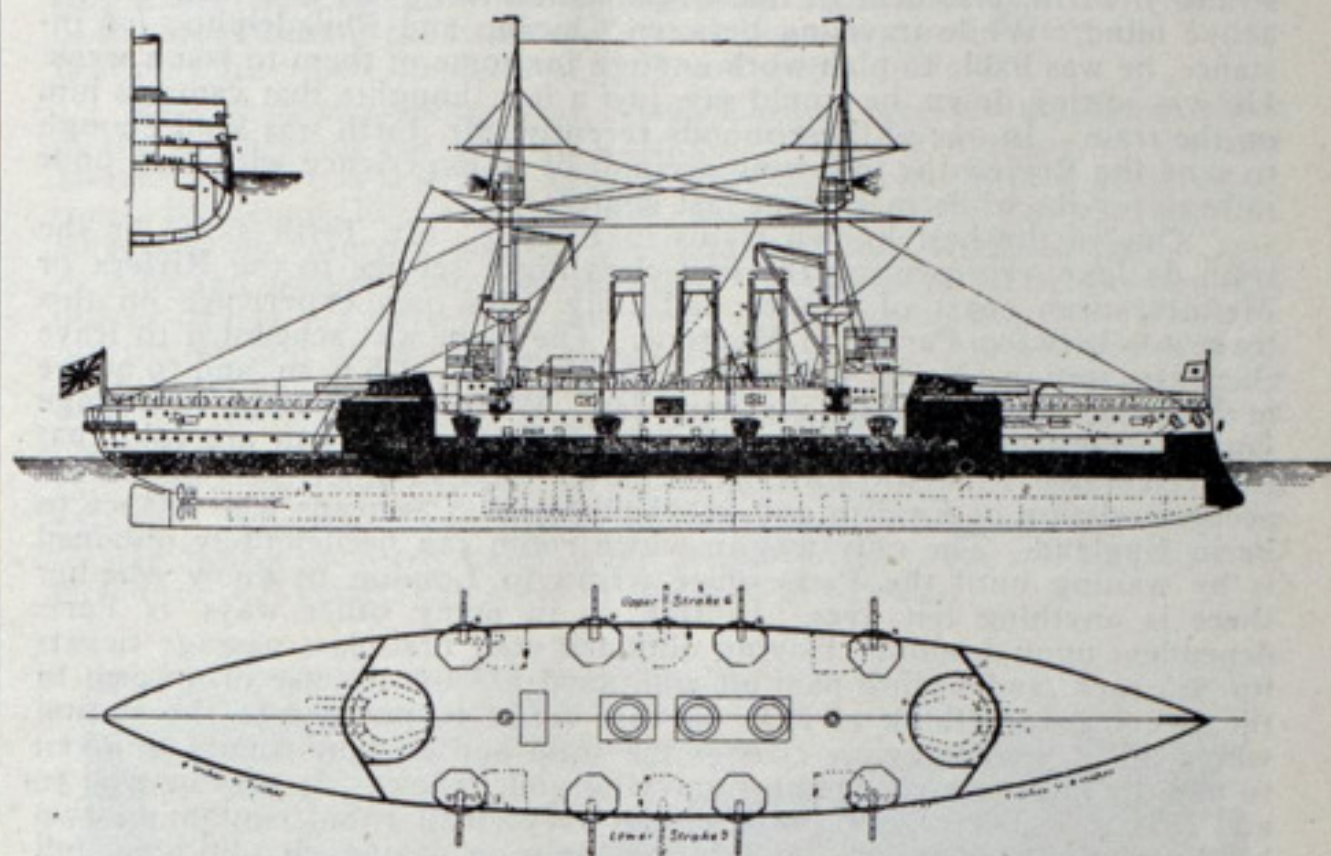
NEW JAPANESE FIRST-CLASS BATTLESHIP SHIKISHIMA.

according to the modern principle, as in ships of this class, its sides being joined to the lower edges of the belt. It has sufficient curve to rise 2 feet 8 inches above the water line amidships. From stem to stern it is 2 inches thick, but an extra plate of 1½ inches thickness is worked on the slope of this deck within the citadel, so that in this part the total thickness of the deck is 3½ inches. The main deck is 1 inch thick within the citadel. The two barbets are circular in plan, and placed with their diameters coincident with the fore and aft center line. The armor on them has a maximum thickness of 14 inches, and runs to the height of 4 feet above the upper deck. There are eight watertight casemates on the main deck, and six on the upper deck, all of 6-inch armor on the outside, and having armor plating at the back to protect the guns' crews from explosive shells.

The armament consists of four 12-inch breech loading guns of 40 calibres, two being in each barrette, and fourteen 6-inch quick-firing guns mounted in the casemates referred to. There are also twenty 12-pounder guns, eight 47-millimetre 3-pounder quick-firing guns, and four 47-millimetre 2½-pounder quick-firing guns. There are four submerged discharges for 18-inch torpedoes, and one in the stem above the water line.

For defence against torpedoes the usual net arrangement is provided in the design.

In October last this vessel underwent her full speed trials off Torquay, running an 8-knot course between Dartmouth and Torquay, obtaining a mean speed of 19.027 knots with 14,667 I. H. P. This speed was beyond the most sanguine expectation; more particularly as the vessel was 1½ inches, or 84 tons, over her load draught, due to excessive water ballast



NEW JAPANESE FIRST-CLASS BATTLESHIP SHIKISHIMA.

having been taken in, in consequence of the bad weather making it difficult to get her true draught while out in the open. The Shikishima is fitted with Belleville boilers, and with all the latest improvements in steering gear, electric lighting, boat equipment, and other details, and, as far as possible iron has been substituted for wood in all her internal fittings.

#### ARMOR PLATE PRICES IN GREAT BRITAIN.

The price of armor plate is becoming a subject of discussion abroad, and comparisons are being made with the price asked by American manufacturers, which are to the credit of the latter. A writer in the Iron and Coal Trades Review of London, after presenting some interesting historical facts relative to the developments in the manufacture of armor plate from the days of wrought iron, takes up the question of cost as follows:

"The recent costs of armor are ascertainable within approximately narrow limits by the published returns of the dock yard expense accounts. These show that each of the eight first-class battleships constructed between 1892 and 1894 averaged about 3,200 tons of vertical armor and backing, etc., the total cost of which was £260,000 per ship, or an average of £81 per ton all round. The backing, of course, would not be so expensive as the armor itself, and if we assume that 600 of the 3,200 tons took the form of backing and accessories, the actual quantity of armor supplied per vessel would work out at about 2,600 tons, and the probable average cost would be £95 to £100 per ton. The writer has taken some pains to get the exact costs of armor as supplied to the British navy, but has not succeeded. The admiralty have refused to give it because they say it is contrary to their policy, although what national interest could be promoted by withholding the information it is difficult to understand, and armor plate makers themselves appear to consider it a secret, being in this respect very different to their competitors in the United States. It is thus necessary to go beyond our own shores, despite our overshadowing interest in ascertaining the facts at home, in order to learn something of the cost of armor plates as they are made today."

The article then presents the familiar details of the Russian contract made by American armor manufacturers, the writer expressing his disbelief that the contract was filled at a loss. Continuing he says: "But even admitting for the moment that this was actually done, we come face to face with the fact that the American navy board is now being supplied with armor for which higher ballistic and other tests are imposed, and in the manufacture of which much more highly paid labor is employed, for fully £14 per ton less than the price stated to be paid to Sheffield manufacturers by our own navy administration. This surely is a matter that calls for a close and searching investigation. As far as we can make out, the Sheffield firms have during the last twenty years supplied to the British government about 230,000 tons of armor. It is manifest that if this armor could have been supplied at the same price as that quoted by the American armor-making firms for the supply of plates to Russia, the average price would have been a little over £50 per ton. If it has cost the nation—as we have reason to believe is the case—an average of about £100 per ton, the British government would in that event have paid £11,500,000 more for its armor than the price at which equally good armor has been supplied to another state as the result of open competition. We do not assert that the facts are just so. But if the case justifies suspicion it is surely because of the seeming conspiracy of silence as to the actual price of armor and the conditions of its production. In any case it is clear that the United States is being supplied with equally good armor for much less money than our own government."

The closing sentence undoubtedly refers to the price of \$545 per ton recommended by the committee on naval appropriations of the house of representatives.

There has been set up at Milwaukee a huge mast 150 feet high for use in the Johnson-Fortier system of wireless telegraphy and preliminary tests have proved highly satisfactory. The system is expected to prove of great value to vessels, both as a means of communication between owners and captains, and also as an aid to the weather bureau in warning vessels of impending storms.



## A TRAIN DE LUXE.

AN INTERESTING LETTER FROM MR. FRANK J. FIRTH ON THE KIND OF SERVICE THAT IS FURNISHED ON A FIRST-CLASS NIGHT TRAIN IN FRANCE.

Officials of the Lake Carriers' Association have learned that Mr. Frank J. Firth, president of that organization last year, is a man of very active mind. While traveling between Chicago and Philadelphia, for instance, he was liable to plan work enough for some of them to last a week. He was jotting down, he would say, just a few thoughts that came to him on the train. In one of these moods recently, Mr. Firth was kind enough to send the Review the following account of an experience with very poor railway service while in Europe last winter:

"One of the best known trains in France," Mr. Firth says, "is the train de luxe, representing the first-class night service to the Riviera or Mediterranean coast of France and Italy. My own experience on this train was between Paris and Mentone. The train was scheduled to leave the Paris station (Nord) of the P. L. & M. R. R. at 5 p. m. and to arrive at Mentone at 11:25 a. m. the next day. When you attempt to engage your sleeping car accommodations in the Paris office you are told that this celebrated French train is after all an English affair, or run for the accommodation of English and, incidentally, of Americans who chance to be in England. The only way in which room can be definitely obtained is by waiting until the Paris office writes to London to know whether there is anything left over. In this, as in many other ways, is Paris dependent upon London. Having obtained your first-class passage tickets for \$25 each, and having paid an additional \$18 for the use of a berth in the sleeping car (think of it!!) you are ready to proceed to the station where all of your baggage crosses the scale and an opportunity is given to pay the high rate charged for carrying your trunks. It may be well to add that if you have one berth in the very small room containing two berths, you can obtain the entire room only on paying an additional full first-class fare of \$25, and a sleeper charge of \$18, or \$43 in all. This amount paid to the company will secure you the use of one small room, or two or three francs paid to the porter entirely legitimately will frequently secure the same result.

"The train due to leave at 5 p. m. did not leave on the evening to which this account refers until 7 p. m., which means a two hours' wait in a glass-enclosed, dirty and badly lighted pen on the platform answering for a first-class waiting room. On entering the train and being shown to our staterooms, we found them very small; very dark; very dirty and full of stale cigarette smoke, with remains of cigarettes and ashes scattered around. The room had evidently been used by a smoking party from Calais to Paris. This is the custom of the country. Everyone smokes, and usually bad tobacco. Courtesy towards ladies and others such as we are accustomed to, is unknown to the travelers who smoke on the French railways. Between the two small staterooms, having two berths each with a little hinged table, there is a small wash room with a basin and water—nothing else. The lavatory arrangements on a like scale of contraction and lack of cleanliness are at the ends of the cars. The cars are intended to be similar to our corridor cars. The staterooms are arranged so that the beds are made up across the width of the car instead of in line with the length of the car as is our custom.

"As before stated the car was very poorly lighted with gas. As the time passed the light became less and less bright, until finally all the gas in the car went out, leaving us in entire darkness. It was not unusual apparently, as the white porters soon commenced to carry candles in heavy brass candlesticks into the staterooms, also depositing a line of them along the corridor. By this meagre light we passed the evening and found our way to bed. About 2 o'clock in the morning the porter entered our locked doors on his pass key without notice of any kind, upsetting things generally on his way to reach the gas light, a new supply of gas having been obtained at some station on the way. Such is the best railway service of which the French people appear to have any knowledge. A train de luxe!! Summed up it stands about thus:

- "1. Exorbitant charges.
- "2. Bad depot accommodations.
- "3. Not on schedule time.
- "4. Cars contracted, dirty and badly lighted.
- "5. Small sleeping rooms used as smoking rooms.

"Compare this with the limited service on any of our American railways and be thankful you live in a civilized country."

## AMERICAN SHIPPING IN THE SUEZ CANAL.

The position of American shipping in the Suez canal in 1899 underwent noticeable improvement, due in large part no doubt, to our operations in the Philippine islands. The number of ships using the canal in 1899 was 3,607, against 3,503 in 1898, and 2,986 in 1897. The gross tonnage of the vessels making the passage was 13,815,982 in 1899, 12,962,622 in 1898 and 11,123,395 in 1897. Great Britain leads, of course by long odds as she does on all waters everywhere. She had 9,046,031 tons in 1899; Germany, which was second in rank and which by reason of the great increase of her trade recently secured a place on the board of directors of the canal company, had 1,492,637 tons, and France, 940,124 tons. Holland had 583,010 tons; Austria, 371,364 tons; Japan, 321,127 tons; Russia, 266,444 tons; Italy, 200,624 tons; Norway, 165,738 tons; Spain, 164,202 tons and the United States of America, 26 vessels of 101,245 tons. In 1898 we passed through the canal but four vessels of 3,161 tons and in 1897 but three of 6,626 tons. This advance in 1899 is very material, and, although induced by conditions which may be but temporary is sufficiently significant. It will be singular if with the upbuilding of our merchant marine we do not soon make a more respectable showing in this great international waterway.

The Nickel Plate road will sell low rate excursion tickets to North Manchester, Ind., account annual meeting of German Baptists (Dunkards) at one fare for the round trip. Tickets good going on May 29 to June 4 inclusive, beyond a radius of 100 miles, and on May 31 to June 8 within a radius of 100 miles from North Manchester, Ind. Good returning until June 10, or by deposit until July 5 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 67 June 4.

## HOPE OF IMPROVEMENT IN IRON TRADE.

In looking for something of a reassuring character while discussing affairs of the iron and steel industry, the Iron Age of New York says:

"Considerable interest attaches to the possible closing down of many iron and steel works during July and possibly August. The Amalgamated Association strongly favors a movement of this kind in order to reduce production, and thus enable manufacturers to maintain prices, which will insure the continuance of high wages. This action, if it should be general, may cause quite a flurry in certain lines to guard against scarcity while mills are closed. The general expectation is entertained among pig iron sellers that a much larger volume of business is to be experienced within the coming month. So many large contracts expire in June that a very considerable number of buyers must re-enter the market, even if they only purchase small quantities. The aggregate of such small business would amount to a heavy tonnage. Reactions are certainly just as well to be expected in commercial circles as in the stock market. When stocks have had a steady decline a time comes when a buying movement sets in. This being done by a number of persons simultaneously leads to quite a stiffening of values. It would not require much business in the iron trade to cause a change in sentiment which would bring about a better feeling. It is by no means apprehended that prices will continue to recede until we again reach the level of 1898. This has not been the history of previous movements of the kind through which we have just been passing. In 1880, after the culmination of that memorable boom, prices settled until they adjusted themselves on a level very considerably above the low rate prevailing in 1878. This is likely to be the case now. The fact that this is the year of a presidential election militates against any expectation of any sharp reaction in prices. Too much depends on the result of that election for large commitments to be made which might prove unprofitable. Men are likely to go slow until absolutely certain that existing conditions will not be radically changed."

## FOREIGN IRON TRADE CONDITIONS.

Mr. James Bowron, treasurer of the Tennessee Coal & Iron Co., who has just returned from an extensive trip abroad, says: "The foreign iron and steel situation exhibits remarkable activity and strength and they say over there that that condition will continue unless we undertake to cause a break from this side. They maintain that America sets the pace and whatever we do they will have to follow. The German and also the English markets are doing a good business, and the situation there depends upon the confidence shown in the iron and steel industry in this country and in our holding prices up. During my trip I sold 25,000 tons of iron to one customer and have two other negotiations pending which are for 100,000 tons each. The consummation of these deals was necessarily delayed on account of the irregular status of our own market, and the sensational reports sent over from here. The whole result of my journey was to inspire additional confidence in the solidity of the export trade which Tennessee Coal & Iron Co. controlled, bearing in mind that it has already for the past four years done an export business approaching 100,000 tons per annum, in pig iron. To this will be added the orders which I find we will be able to take for steel, bar iron, light rails, coal and coke. I was offered orders in Italy for fuel running into hundreds of thousands of tons. The whole continent of Europe is suffering for fuel and this in turn must react upon the iron trade by holding up the cost of production. The confidence of Germany in the situation is most marked by its purchase of the entire output of the new Swedish ore fields up to 1912."

## SENATE NAVAL BILL.

The naval appropriation bill has passed the senate and whatever differences exist between it and the house bill will now have to be settled in conference. The differences, however, are minor in their nature. The senate bill authorizes the secretary of the navy to purchase armor at \$545 per ton to complete the Maine, Missouri and Ohio, but provides that if he cannot purchase it at \$445 per ton for the other battleships authorized he is to proceed at once to erect a government armor plate factory. The sum of \$4,000,000 is appropriated for this purpose, of which \$2,000,000 is made immediately available.

The secretary is also authorized to contract for five submarine boats of the most improved type to be built by the Holland Submarine Torpedo Boat Co. The boats are to cost \$170,000 each. The act also contains this provision:

"The secretary of the navy is hereby directed to cause plans and estimates of cost to be made for the construction of vessels fitted to transport two, four and six submarine torpedo boats of the Holland type, respectively, and to lower and hoist them with the utmost expedition, said vessels to carry also such guns as may be best suited to their uses as armed craft, to be used also as transports of submarine torpedo boats. The secretary is also directed to cause plans and estimates to be made for the conversion of one or more transports now belonging to the United States and which he may deem best suited for such conversion into transports for the conveyance of submarine torpedo boats of the Holland type."

The bill provides for the purchase of the floating dry dock at Havana at a cost not to exceed \$275,000.

## DIAL COMPASS AND COURSE CORRECTOR.

Capt. John M. Fields of San Francisco is the inventor of a reversible dial compass and course corrector, which is in use on some 250 vessels of the Pacific coast, and which he is trying to introduce on the lakes. Capt. Field will probably spend the greater part of the present season on the lakes. His instrument is designed for the convenience of navigators in ascertaining the deviation of compass or finding a true or magnetic course. He says its strongest recommendation is its simplicity—absolutely no figuring of any kind in connection with it. The instruments were used on the government transports of the Pacific and are highly recommended by officers of those vessels. One of the instruments is to be put aboard the Mutual line steamer Coralia at once.

BACK NUMBERS OF THE REVIEW.—Liberal subscription extensions will be made by the Marine Review for issues of Jan. 21, 28 or Feb. 4, 1897, or July 21, 1898.



## AROUND THE GREAT LAKES.

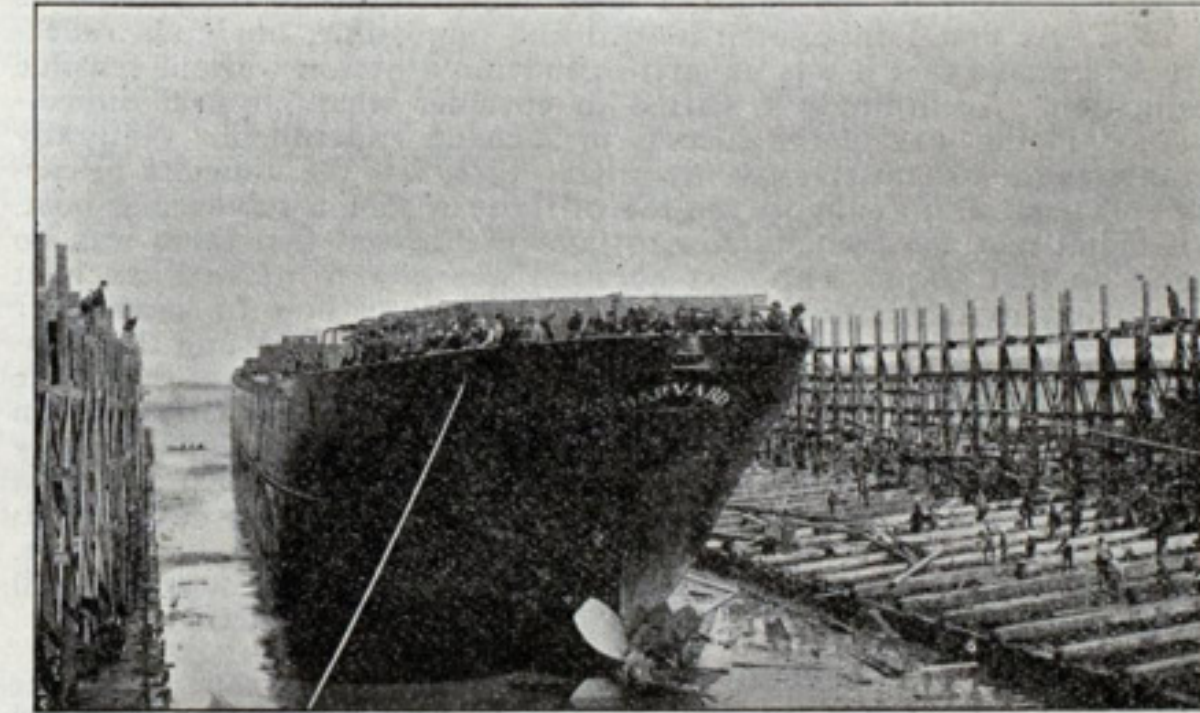
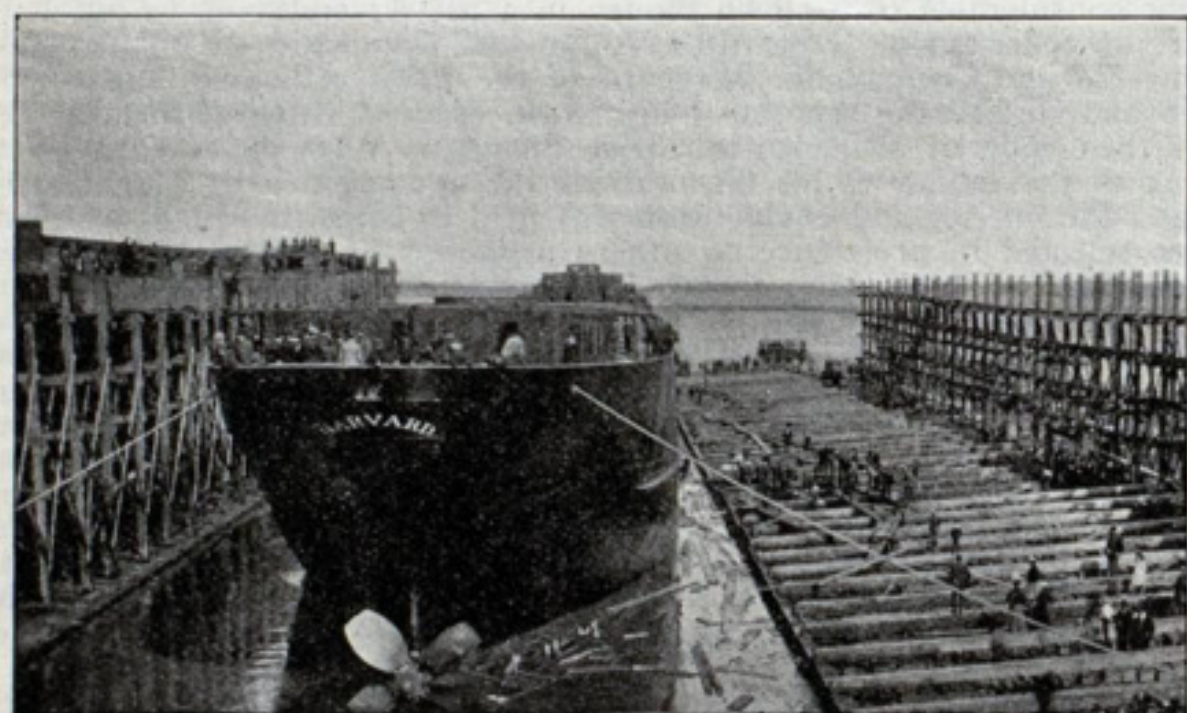
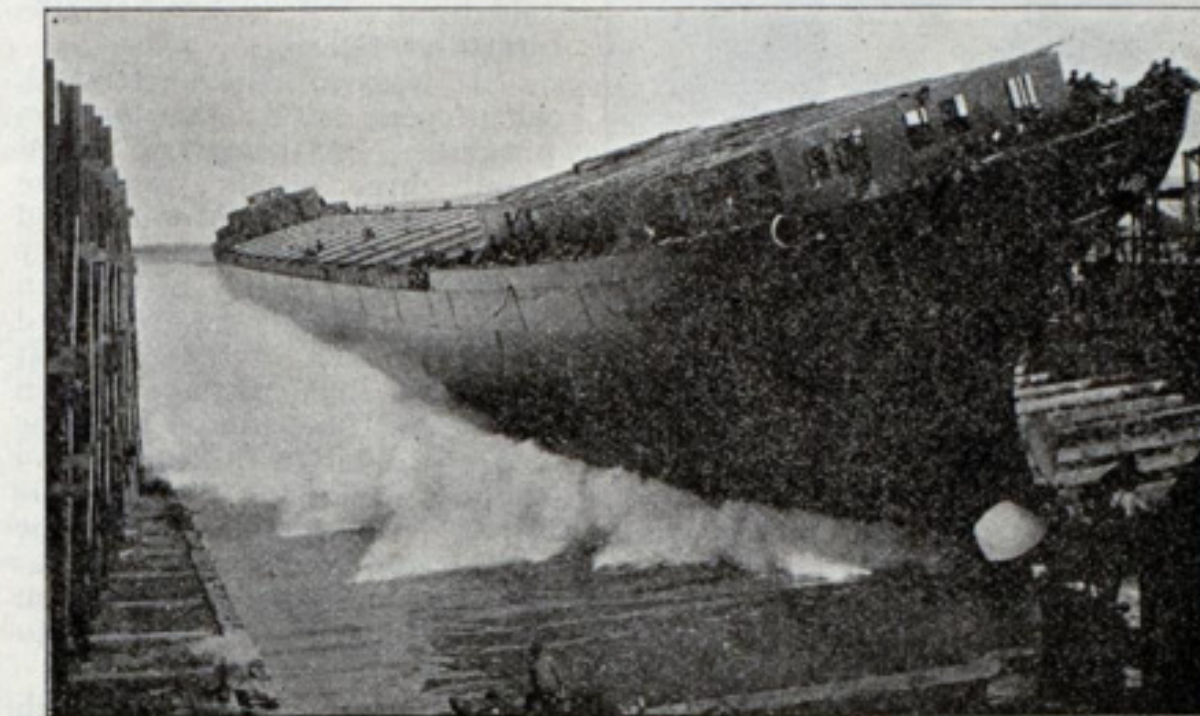
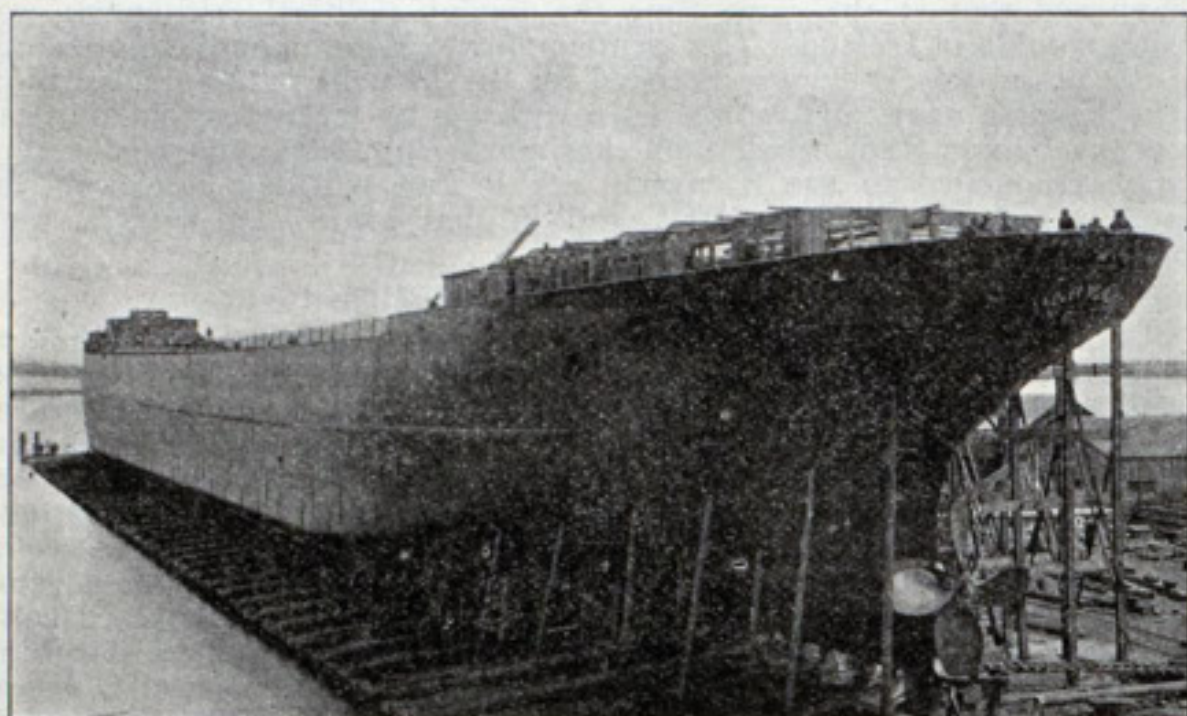
Mr. J. E. Upson of the Upson-Walton Co. has been elected president of the Wilson Transit Co. Mr. Upson was interested with Capt. Wilson in nearly all his vessel investments.

Mr. T. P. Gordon, who was for some time engaged in insurance lines with Johnson & Higgins of New York, is now with Hayward & Wrecks, average adjusters and insurance brokers of No. 65 Wall street, New York. Mr. Gordon will make his headquarters in Buffalo.

Another of the Pittsburg Steamship Co.'s new steel freighters, the Lafayette, is about ready for launching. The Lafayette is one of the two steamers building for this company at the Lorain yard of the American Ship Building Co. It is expected that she will be launched on Thursday next, the 31st inst.

Crerar, Clinch & Co. of Chicago, who operate the Columbia and Mansfield iron mines, have secured control of the Voos mine on the Menominee range, and will soon start work sinking the shaft deeper and preparing to ship the lean Bessemer ore that is in sight. It has been estimated that there are 30,000 tons of ore that will average about 50 per cent. iron and .020 phosphorus now in sight at the property.

Some of the lake barges that went to the Atlantic coast a year or more ago are returning. Mr. James Corrigan of Cleveland a short time ago bought from J. C. Gilchrist the barge Foster and now he has purchased from the estate of Valentine Fries the barge Marion W. Page.



**Launch of the Carnegie Steamer Harvard at the Works of the Detroit Dry Dock Co.**

(The above half-tone reproductions are from beautiful photographs (copyrighted) made by the Detroit Photographic Co.)

Both of these will be brought up the St. Lawrence canals from the coast as soon as possible. The schooners F. A. Georger and Moonlight of the J. C. Gilchrist fleet will also be brought back to the lakes.

Referring to the proposition of the Canadian government to build a light-house and fog signal station on the middle ground, Pelee passage, Lake Erie, instead of rebuilding the burned "dummy" light, Capt. C. E. Benham, United States deputy collector of customs at Cleveland, says: "The move is a good one, and will give universal satisfaction to vessel masters. If the Canadian government could be induced also to remove the light from Pelee island and install it upon the southeast shoal, the entrance to the north passage would then be rightly marked. It would save many vessels from striking upon that shoal, which extends more than 3 miles to the southward and eastward from the old "dummy." The light upon the island is of very little use."

Another large ore dock at the head of the lakes, that of the Eastern Minnesota Ry. (J. J. Hill company) will soon be in full operation. The dock has already received some ore, but the pockets are not yet all in shape for shipping. This dock has 250 pockets. Each has a capacity of 260 tons, making a capacity of about 70,000 tons for the entire dock. This amount can be loaded into boats in twenty-four hours, but it takes somewhat longer to accommodate cars enough to fill up the dock. The structure is much higher and wider than any other dock in the Lake Superior region. It is constructed of Washington fir, about 15,000,000 feet having been used in the construction of dock and approach. The company has put in a fine electric system and will run both the new and old docks night and day.

As a testimonial of the love and esteem borne by employees of the Goodrich Transportation Co. for the late Capt. John W. Gillman, \$1,000 has been subscribed by them for the erection of a granite monument to

his memory. The monument will occupy a site in Graceland cemetery, Chicago, where the body of Capt. Gillman now rests. It will be of white granite, with a base 8 feet square. The top is a unique design of an old-fashioned capstan with several strands of rope around it. This capstan is upheld by a square block with several strands of rope at each corner tied with a true lover's knot, and the block is supported by old-fashioned ship-knees, making the whole an ingenious nautical design. On the face of the monument is the name of Capt. Gillman in raised letters, and underneath are inscribed the dates of birth and death, 1837-1900.

With each succeeding year South Chicago gets an additional share of the business of the port of Chicago. With the opening of the new Merritt elevator, a few days ago, South Chicago has twelve great elevators. Bartlett & Frazier have three, Counselman two, Peavey two, McReynolds one, Merritt one, and the Calumet Grain & Elevating Co. one. At Chicago proper there are twenty-seven elevators. The Indiana and one or two others have been shut most of the season thus far. The new Merritt elevator at South Chicago is located on the Calumet near Ninety-sixth street and is of 1,000,000 bushels capacity. It is expected that about 2,000 feet of the breakwater recently begun at South Chicago will be completed this season. The breakwater will extend from northwest to southeast, and when completed will be nearly 4,000 feet long. It will cost about \$375,000. A commodious harbor of refuge will be created for vessels for shelter during northerly gales, while the harbor entrance will be fully protected, so that vessels can enter in any kind of weather.

## NAVAL MATTERS.

Rear Admiral Hichborn, chief constructor of the navy, has arrived at San Francisco on a tour of navy yard inspection. He will visit Mare island navy yard and then go north.

Secretary Long has ordered the re-establishment of the European station. It is true that in the beginning the United States squadron in European waters will consist of but one ship, but it is expected that in the course of time, as more officers are found available for duty, other vessels will be commissioned and sent abroad to join the station.

The naval policy board held its second session Tuesday, after a recess of about six weeks. At its first meeting the board took steps to secure reports from various sources, including naval and army officers of reputation in certain lines, respecting the work to be undertaken by the board itself in the direction of framing plans for national defence. Many of these persons have responded, and it is understood that much of the time of the present session will be given to the consideration of these reports. Meantime the same rule as to the secrecy of the proceedings that was imposed at the first meeting is strictly observed.

A substitute bill has been introduced in the senate providing that any officer of the navy retired from active service for disabilities incurred in the line of duty may be restored to the active list of the navy, provided that his physical, mental, moral and professional qualifications meet the approval of the examining board. No officer so restored to the active list shall be given place in his class above that occupied by such officer at the date of his retirement; nor above the rank of lieutenant-commander; and officers so restored shall be carried as additional to the numbers of each grade to which they may be appointed or thereafter at any time promoted. The bill meets with the approval of the secretary of the navy.



## JOHN P. HOLLAND ON THE SUBMARINE BOAT.

The naval bill, as it passed the senate, authorizes the purchase of five Holland submarine boats, and as these singular craft are to be a permanent addition to the United States navy something about the man who has devoted his life to solving the problem of submarine navigation may not be amiss.



JOHN P. HOLLAND.

John P. Holland is an Irishman, Irish to the tips of his fingers, and one to whom it is a great delight to listen. It was the fight between the Monitor and the Merrimac which led him, then a schoolboy in Ireland, to reflect upon the possibilities of submarine navigation. He realized that the revolution from wooden sides to iron clads would make England with her immense iron works the dominant naval power in the world and he began to ruminate how this power might be lessened. His mind naturally turned to submarine defense. The story of the invention as told by himself, makes very interesting reading.

"I was in Cork, Ireland, when your civil war was in progress," he remarked, "and about three weeks after the battle between the Monitor and the Merrimac it struck me very forcibly that the day of wooden walls for vessels of war had passed, and that ironclad ships had come to stay forever. I reflected that with her tremendous facilities England would apply them to the situation and become the chief naval power of the world; and I wondered how she could be retarded in her designs upon the other peoples of the world, and how they would protect themselves against those designs. A short time after that, following out the ideas thus inspired, I thought it ought to be possible that a boat could be made that would go under water. Then I was only aware that the only man who had ever tried to solve that problem was Robert Fulton, the inventor of the steam boat, and that his attempt was a failure.

"Some years afterward—it was in 1870, I think—I was in bad health and was compelled to take a vacation from my duties, and for awhile time passed heavily on my hands. I happened to revert to the submarine boat idea. At first I thought it absurd and impossible, but upon reflection I determined that it was unfair to condemn a notion without sensible investigation. Accordingly I started to consider what physical difficulties stood in the way of the success of such an experiment. Naturally several suggested themselves to my mind. First was the difficulty of carrying sufficient air to support the life of those within a submerged boat, but it didn't take me two minutes to convince myself that there was no obstacle on that point. The next question was how to prevent the boat from sinking to the bottom when under water, and how to handle her when submerged in case sufficient power was available. I found the solution to these problems simple enough, because it was very plain that if the boat and its contents together could be made of the same weight as an equal volume of water a very slight force would make it move in any direction, either up or down or horizontal, and therefore that the boat could be propelled by the ordinary propeller, and her motions in the vertical or horizontal planes be controlled in the ordinary way by rudders. There were practically no other difficulties in the way, the strength of shell to resist pressure of the water being a very simple one, indeed.

### COMPLETED THE FIRST DESIGN.

"I completed a design that embodied most of the principles developed later in the present boat. One of them was that a submarine boat should be as small as possible consistently with possessing sufficient offensive powers. She requires no other defensive power than submerging herself rapidly and availing herself of the armor provided by the water, so to speak. I laid my plans away in an envelope among my papers and thought little more of them until I came to this country in 1873, and one day in the following winter I slipped on the ice in Boston and broke my leg. I was laid up for three months, and, needing something to pass the time away, I began to think of my submarine boat. I had a search made through my effects for my former solutions of the problem and fortunately the friend I had intrusted with the duty found them. When I was on the point of opening the envelope containing them it occurred to me it would be better to begin at the beginning of the subject and study it out over again from the start without looking at what I had done before. I followed out my impression, and I was very much surprised and gratified to see that both plans were almost exactly alike, embodying the same principles. I then put them both away and actually forgot all about them until in 1875 a friend who happened to be going over some of my papers discovered them and urged me to send them to the navy department. I did so immediately, and Secretary Robeson referred them to the late Admiral Simpson, then a captain at Newport. After careful study Capt. Simpson praised their ingenuity and admitted the practicability of everything claimed for a boat built according to the plans, but rejected them on the ground that it would be impossible to get men to operate such boats. The subject was again referred to Capt. Simpson, who again rejected them on the ground that the boat could not be steered under water; that it would be like a man trying to navigate a vessel in a fog."

At this reminiscence Mr. Holland smiled. "But a few weeks afterward," he continued, "I wrote Capt. Simpson, requesting his advice, unofficially, as to what I should do, seeing that my plans were rejected by him after he had made the admission that they seemed to be all right. He very kindly advised me to drop the whole matter, assuring me that it was very uphill work to put anything through in Washington. Now, con-

sidering that the word 'anything' is very broad and covers even perfection itself, I judged it wise to follow his advice to drop it, and so I did. In the early summer of '77 a friend advanced money to build an experimental vessel, but he insisted that I should put engines in it. That boat was built at the old Albany street iron works, New York. I experimented with it on the Passaic river above the Falls bridge at Paterson, N. J. I made some important discoveries, even though I was hampered by an engine that proved to be practically worthless. My friend was so very well satisfied with what he had seen that he urged me to abandon that boat and build a larger one, suitable for use in war. Accordingly, the first boat was sunk in the middle of the Passaic river and abandoned, and I immediately started to work on my second vessel at Delamater's shop, foot of Thirteenth street, North river, New York. This boat was finished in April, 1881, and she was very successful indeed.

"This vessel excited the curiosity of everybody, particularly newspaper men, but the policy of my partner in the business forbade us giving them any information. They were always courteous and gentlemanly, but were invariably annoyed at our reticence. On one occasion one of them, having witnessed a few successful dives and being refused permission to go into the boat, told me I was making a mistake, because newspaper reports would help in the place of hindering the project. He noticed, however, that the machine was evidently designed for the destruction of warships, also that the designer was unmistakably Irish, judging by his brogue, and it happened that at the same time the Fenian political excitement was causing trouble in Ireland. This gentleman was good enough to conclude that the vessel was evidently intended for the Fenians to help them blow up the English navy, and he got even with me by facetiously naming my vessel the Fenian Ram, which name has stuck right hard, and I have even become reconciled to use it myself. A 16-foot working model of the present vessel was built in 1882, and in that some new devices were applied.

### A LONG SERIES OF DIFFICULTIES.

"For some reason unknown to me my partner seized both boats and had them towed toward New Haven. On the way up the smaller vessel was allowed to sink opposite White Stone, Long Island, and it went to the bottom in 110 feet of water. An attempt was made on two or three succeeding days to locate it by dragging, but they failed to find it, and it was lost. The other boat was hauled out of the water at New Haven, and she is lying there still. Our partnership having been dissolved by the seizure of my boats, I endeavored to start a company in order to develop the idea. In 1886 Capt. Zalinski of dynamite gun fame organized a company for me. We built a rough experimental vessel, wooden sheathing on iron frame, with the object of satisfying the stockholders that it was possible to navigate her under water. That vessel fell off the ways while being launched, and was irreparably injured, even though Capt. Zalinski spent considerable of his own money in a useless endeavor to put it in working order again. Toward the end of 1887 Commander Kimball, Capt. Converse and Commander Maynard of the naval ordnance department, who had studied the reports of my work, induced Admiral Sicard, who was then chief of ordnance to advise Secretary Whitney to appropriate some of the money at his disposal for the construction of a submarine boat. He did so, and competition was held in 1888, in which my plans were selected in preference to others proposed by Nordenfeldt, Baker, Professor Tuck and some others. I failed to get the appropriation, owing to an informality in my bid that was made for me by the Cramps of Philadelphia. Another competition was held the following year, in which my plans were also successful, but I failed to get the money again, because after the decision was given in my favor a change of political parties occurred. Gen. Tracy succeeded Mr. Whitney, and the appropriation that I had won twice was diverted, as funds were needed to complete the Monterey in San Francisco. I was so discouraged by my repeated failures with the government that I determined to renew my resolution to drop submarines for good, but Mr. Kimball continued to urge me to try again. A new company was formed by Mr. E. B. Frost of New York. Another appropriation was gotten in 1893, and in 1895, after repeated setbacks, I contracted with the government to build the Plunger. During the development of the plans for this vessel numerous difficulties were encountered due partly to the navy department's requirements. I proposed alterations that were not accepted, and so I was compelled to build the boat from the original plans. Knowing that at best the Plunger would be but an imperfect vessel, owing to these causes, I advised my company to build another vessel at its own expense, in which I should be left absolutely untrammelled by any conditions prescribed by the navy department, and the result is the Holland."

### CONSOLIDATION OF STEAMSHIP LINES.

It appears from an interview which President B. N. Baker of the Atlantic Transport Line gave out in Baltimore, a few days ago, that the deal for the consolidation of his company with the Leyland line is off. Mr. Baker said that the negotiations would not be resumed and that the Atlantic Transport line would be operated without any change.

Now it is announced that the Leyland line (Frederick Leyland & Co., Limited) has purchased the West India & Pacific Co. The price paid was £990,000. It seems that negotiations between the companies have been pending for some time. It is said that the Leyland line is also negotiating for the absorption of other steamship lines.

The steamships of the West India & Pacific line ply between Liverpool, Venezuela, Colombia, West India islands, Mexico and the United States, carrying passengers and cargo. Its fleet consists of twenty steamships, as follows: American, 8,195 tons; Antilian, 5,608 tons; Atlantian, 9,354 tons; Barbadian, 4,501 tons; Bernard Hall, 2,678 tons; Columbian, 5,613 tons; Costa Rican, 3,251 tons; Cuban, 4,201 tons; Darien, 3,362 tons; European, 8,194 tons; Floridian, 3,257 tons; Indian (building), 9,000 tons; Jamaican, 4,501 tons; Louisianian, 3,642 tons; Mexican, 4,201 tons; Nicaraguan, 3,642 tons; Tampican, 4,838 tons; Texan, 3,257 tons; William Cliff, 3,352 tons; Yucatan, 2,816 tons. The American and European are at present under charter to the Atlantic Transport line.

A new revenue cutter for Long Island sound called for in a bill presented to congress last week will cost \$230,000.



### THE SOFT-NOSED PROJECTILE.

SENATOR TILLMAN'S REMARKS IN THE SENATE CAUSED GENERAL SURPRISE IN THE NAVY DEPARTMENT.

Naval officials profess to be surprised that the press reports of the test of the Johnson soft-nose projectile at the Indian Head proving grounds should create such widespread interest and be regarded as revolutionizing the armor question. The soft-nose shell had been used by the navy since Admiral Sampson was chief of the ordnance bureau, although it had not been perfected until within the past two years. That it gives additional value to the armor-piercing projectile is admitted in naval circles, but officers contend that it has no great bearing on the armor question.

The inventor of the shell is I. G. Johnson of the Johnson Steel Co. of Spuyten Duyvil, N. Y. Through the use of a soft steel cap over the hard point of the projectile, a bed to hold the point in place as it enters the armor is formed. This permits the projectile to strike the plate squarely, prevents glancing and wobbling and serves as a lubricant. The principle is the same as that applied in driving a needle through a coin by means of a cork, which holds the needle in place, keeping the point firm against the metal. Mr. Johnson will not sell his patent rights to any nation except the United States, and his process is believed to be sufficiently involved to prevent successful imitation by ordnance experts.

It was demonstrated several years ago that no armor could resist shell fire where the distance between plate and gun was sufficiently short and the shell large enough and of good material. But the naval ordnance experts are working to secure such shells only as will pierce armor at the distances under which naval engagements would ordinarily be fought. Any Krupp plate, it is contended, may be pierced at a hundred yards, but modern armor clads would probably never fight at such a short range. The velocity of the soft-nose projectile fired at the Krupp plate at Indian Head was regulated to conform to a 2,000-yard range. That the plate was bored from face to back by two 6-inch shells indicates that the soft-nose is available for successful use in a naval engagement. The navy department will make another test of the Johnson cap to ascertain whether it will enable a shell to penetrate a plate when a glancing blow is struck. Should the test be successful the soft-nose will have shown its superiority over the sharp-pointed, hard shell cap with which ordinary armor-piercing projectiles are fitted.

Russian ordnance experts first conceived the idea of covering the heads of armor-piercing projectiles with a soft substance. They failed to make a success of their experiments and Rear Admiral Sampson took up the matter personally four years ago when he was chief of the naval ordnance bureau. He tried several metallic substances as caps and experimented also with lubricating material. The object of using the lubricating material was to stick the cap to the armor plate, form with the soft metal a firm support for the rest of the shell as it entered the target and grease its way into the armor. Admiral Sampson was using soft steel for the cap and graphite for the lubricant when his term of office as chief of ordnance expired and he was ordered to the Iowa. Mr. Johnson began conducting experiments and succeeded in overcoming the chief difficulty, that of attaching the soft nose to the projectile proper. He took out patent rights on his invention and these were acquired by the United States two years ago.

Experiments with soft capped projectiles were conducted by the naval ordnance bureau three years ago while Admiral Sampson was its chief. In every case the capped projectile penetrated deeper into the target than did the uncapped projectile. The targets were plates of face-hardened armor. Various ranges were employed, the perforation being obtained with normal impact. Service muzzle velocities obtained from smokeless powder were used. Soft caps for armor piercing shells were provided for the American ships in the Spanish American war, but were not used, as no occasion arose where uncapped shells were not suitable.

#### REAR ADMIRAL O'NEIL SURPRISED.

Rear Admiral O'Neil, chief of the naval bureau of ordnance, is surprised at the attention given by the public to the new soft-nosed shell. "There is nothing new in this cap," said the admiral, "except that we have just had a chance to try it on Krupp armor. There has been nothing new in projectiles for four years that I know of. We have known for that length of time that a cap of this kind would increase the force of a shell 15 or 20 and in some places 25 per cent. That is all there is to it, and this ratio of advantage applies to the Krupp as well as to the Harveyized and lighter plates. The public seems to have a very erroneous notion as to armor plate; the people think it invulnerable. Such is not the case. In the struggle between the gun and the armor the gun is ahead and probably always will be, since there is a limit to the weight of the armor which any ship may carry. It is one thing to penetrate armor at close range and in favorable conditions and quite another when striking the ship at sea, which is always in more or less motion. If a shell strikes obliquely its power is greatly lessened, and, of course, lessens with the distance. The reason the hard-nosed shell does not penetrate armor is because of lack of lubrication. A series of experiments resulted in the addition of a soft-nosed cap, which acts as a lubricating element to the point of the projectile.

"This cap, or nose, unlike the sharp-pointed nose of the ordinary armor-piercing shell, has a round end. It is composed of steel, softer by comparison only with that of the rest of the projectile. The theory of its use against armor is that it flattens against the hard face of the plate and thus forms a lubricant or 'puddle' into which the rest of the shell passes easily. Once obtaining an entrance into the soft steel, which becomes welded to the face of the plate, the projectile proper continues its penetration, made all the easier by being held to a straight course by the puddle. The Krupp plate used in the recent tests was 6 inches in thickness, and the firing was done with 6-inch shells. The firing range was short—2,000 yards—and for that reason the effect of the shell on Krupp armor at long distance was not demonstrated. Similar experiments were made with an 8-inch shell and with like success."

The builders' trial trip of the Russian cruiser Variag, now in process of construction at Cramps' ship yard, will be held this month.

### NEW STORM SIGNAL TOWERS.

Secretary Wilson has just started in the weather bureau an improvement of great interest to navigation. Realizing the value of the storm warnings of the bureau in the saving of life and property, the secretary directed that experiments be made with the view of adopting an improved method of issuing warning signals from marine ports. With the co-operation of several important manufacturing establishments a new iron storm warning tower has been constructed and adopted by the secretary. This tower, being constructed in sections, can be extended to a greater or less height, in accordance with the visual conditions of different ports. Near the top of the tower two powerful French fresnel lense lamps are located and above the lamps is the flagstaff from which day signals are to be displayed. The old inferior marine lantern, which consumes oil and which has been displayed only from wooden staffs, will be discarded by order of the secretary and the display of danger warnings more efficiently made by the introduction of the new iron towers.

Congress, in accordance with the recommendations of the secretary, made an appropriation sufficient to equip one-half of the 300 display stations of the bureau during the coming year. Secretary Wilson has directed the chief of the weather bureau to distribute these new towers as equally as possible between the lakes and sea ports, as only one-half of the service can be equipped during the present year. Electric lighting for night signals will be introduced at all wind signal display stations where it is available. Among stations on the great lakes already equipped with electric lights are Ashland, Washburn, Manistique, Gladstone, Kenosha and Charlevoix. It is the intention during the present season to erect at the more important stations a steel tower for the display of storm signals. It is also proposed to erect these special steel towers at all wind signal stations on the lakes as soon as practicable. The erection of these towers will be noted on the monthly lake charts.

### NEW WORKS OF THE FORE RIVER COMPANY.

The following letter from the Fore River Engine Co. of Weymouth, Mass., in answer to an inquiry relative to improvements in its works, is self-explanatory:

"The Fore River Engine Co. has purchased sixty acres of land at Quincy Point, Mass., about two miles further down the Weymouth Fore river than our yard is at present situated. We have at the new location over a mile of water front for wharves, and about 1,500 feet for launching ships with a depth of water of 32 feet. We have now under construction a ship-tool house 390 feet long and 70 feet wide, which will contain modern tools of capacity for the heaviest possible hull work. The machine shop is 210 feet long and 120 feet wide, with galleries containing in all 37,000 square feet of floor surface, and will have the heaviest type of machine tools, including four lathes with beds 107 feet long. The power house, 102 feet long and 65 feet wide, is designed to contain boilers of 1,000 horse power capacity, compound engines driving electric generators in units of 200 horse power, air compressors, pumps for hydraulic accumulators, etc.

"In the forge we are installing one 17-ton hammer, one 8-ton hammer, one 4,500-pound hammer and several smaller hammers, together with a complete plant for oil tempering and annealing nickel steel shafting and other forgings. All the machines in the ship-tool house and machine shop will be run by electric motors on the multi-voltage system.

"We shall lay the keel of the 3,500-ton cruiser Des Moines at our new yard at once, and expect to have the plant in full operation in about four months, as our new tools are beginning to arrive. The capacity of our new plant will be sufficiently great to allow the construction of the largest battleship, armored cruiser or merchant vessel, and we have sufficient launching front to build ten of the widest ships at once without interfering with our wharves. Our new location is an ideal one for ship building in every way, and will place us in the front rank of the business."

### THE NEW CUNARD LINER SAXONIA.

The latest addition to the fleet of the Cunard Steamship Co. is the Saxonia, a sister ship to the Invernia. She is 600 feet long, 64 feet broad, and her depth is 41.6 feet. Built and engined by Messrs. John Brown & Co., Clydebank, the Saxonia presents a magnificent appearance. Her gross tonnage is 14,000. She combines enormous deadweight carrying capacity with ample and spacious accommodation for passengers. The public apartments are large, well ventilated, and lighted with electricity. The decorations are at once artistic and effective, and the fittings are of the latest pattern. There is accommodation for 160 first-class passengers, 200 second-class and 500 steerage. On the upper and main decks special arrangements have been made for the reception of horses and cattle, and the steamer is extensively sub-divided, both transversely and longitudinally, rendering her practically unsinkable. She is also fitted with double-bottomed ballast tanks. In connection with the first-class passenger accommodation a very prominent feature is made of the sleeping berths, the front portions being all of imitation silver and of a very handsome design, embodying the arms of the Cunard Steamship Co. All these berths are arranged to fold up when not in use, and the sofas are also fitted in the same elaborate and elegant manner. The berths and sofas in the second-class rooms are likewise fitted with imitation silver fronts, but of a plainer description. The third-class accommodation and the accommodation for the crew are also very much in advance of what would be found in the best of the Atlantic liners a few years ago.

### CRUISER ALBANY WILL SAIL SHORTLY.

Commander Richardson Clover, the American naval attache in London, who recently visited the works of the Armstrongs at New Castle-on-Tyne, whither he went to inspect the United States cruiser Albany, says that the gun trials of that vessel will take place on May 22. He expects that the trials will be very satisfactory. The Albany will then sail for the United States. Commander Clover declares that the cruiser should be a very useful addition to the American navy. She has many technical improvements over her sister ship, the New Orleans. The delay in getting the vessel ready to sail was caused by the necessity of putting steam heating pipes in her. Her crew is aboard. The mayor of Newcastle will tender a farewell entertainment to her officers.



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Great men and great things have small beginnings. Napoleon before he went into the army endeavored to rent houses in Paris in order that by sub-letting them he might make a living and he made a miserable failure of it. Napoleon made a poor real estate agent, but a good soldier. The humble beginning of the great institution known as Lloyds, often referred to, makes an interesting story. Lloyds had its birth in a little coffee house in Tower street, London, where seafaring men were wont to congregate and to relate the happenings of the sea. Gradually sailors began to look upon Lloyds as a place where news was more likely to be obtained than at any place else. Lloyd recognized the attraction of this intelligence to his coffee house and gradually began to post little bulletins of such scraps of information as floated into the place. Some of it was frequently four or five or six months old. Later he took to publishing it upon a single sheet of paper and called it Lloyd's News. That was the forerunner of the present Lloyd's List, the oldest newspaper in the United Kingdom. Ideas were exchanged there as to ship construction and gradually defined principles of what ought to be and what ought not to be were laid down. Out of this came the present register and classification which is the standard in maritime circles. The rating and insurance features followed naturally and people completely forgot that Lloyds was ever a coffee house. Lloyds was incorporated by act of parliament in 1871 to carry on the business of marine insurance and to collect and diffuse shipping intelligence. Its annual business in insurance has reached a total of over £650,000,000.

What is to be taken as an index of a man's character? Where is to be found the key to the innermost chamber of a man's thought? The outward semblance is not always the true reflection; and a man rarely speaks of those things which lie closest to his heart. Those who live and move and have their being with us are frequently those whom we know the least. They possess thoughts and sentiments of which their words and actions give no feather. The inner life, which is the true life, is rarely revealed; and when it is it is like reading by lightning—the illumination is so startling. Of the thousands who knew Thomas Wilson it is doubtful if more than one or two knew of his plans to found a home for old couples, and it is doubtful if ever they knew how much a part of him it was. But Thomas Wilson had the plan in mind for years. He was fond of old people. He knew that the race is not always to the swift nor the battle to the strong, but that time and chance happeneth to all men as much today as it did in the days of Solomon. He knew that many worthy couples through no fault of their own come to grievous misfortune in their old age, and it was to prevent the inevitable separation which this misery entails that he conceived the idea of establishing an institution where they might end their days together in comfort. Years ago he spoke of it to some intimate friends, but gave no indication that it had become a settled purpose with him. The thought was worthy of the man and the man worthy of it.

The senate has passed the naval appropriation bill and the only thing that now remains to be done is to eliminate a few differences in conference. In the senate measure the navy department is permitted to spend \$545 per ton for armor for the Maine, Missouri and Ohio but is restricted to \$445 a ton for all other vessels authorized. Should the department be unable to obtain armor at the latter figure, \$4,000,000 is appropriated for the construction of an armor plate factory, of which sum \$2,000,000 is to be immediately available. The purchase of five Holland submarine boats is authorized, and altogether this sort of craft is looked upon with great favor. The gist of this legislation is to insure the completion of the Maine, Missouri and Ohio, but it prevents work upon the three battleships and three armored cruisers authorized in the act of March, 1899. As to the program of new ships contemplated in the present bill its realization is remote unless a future congress shall remove the restrictions. The establishment of the armor plate factory is not likely to proceed any further than the paper upon which the act is written. Whatever the intention of its framers may be the whole effect is to delay. The first ton of armor from a government factory would cost \$4,000,000 and it would take four years to produce it; and the chances are by that time new processes and new conditions would have made the plant obsolete. The government had better let the business of manufacturing alone.

What a pity it is that so many vessels, especially on the great lakes, are known by the same name! The confusion is often very annoying.

In naming its new freighters on the lakes for the principal colleges of the country the Pittsburg Steamship Co. (Carnegie interest) laid the name Columbia aside—reluctantly, probably, and the action is therefore all the more commendable. To be sure the name with which the boat is to be christened, Rensselaer, is trying on one's orthography, but it possesses the prime virtue of unmistakable identity. If it comes in over the wire Rensler, Rennsaller, Rensaler or any other combination of letters, as it doubtless will when the lake chroniclers begin to struggle with it, there will be no doubt whatever as to which boat is meant. Were the boat named Columbia, however, there would be constant confusion. It would make the present puzzle a little more complex. There are at present six Columbias and one Columbian on the lake list. It would be well for all the vessel builders to emulate the example of the Pittsburg Steamship Co., and see that hereafter no duplication of names occurs.

Sir William White of the British Admiralty has calculated that in an Atlantic liner of 20 knots a weight of about 1,000 tons could be saved by using nickel steel instead of mild steel. The greater becomes the size of ships, the more important must this saving be. It is only within the last forty years that we have seen the evolution of steamers making over 11 knots, and at a much more recent period the fastest Cunarder did not exceed that speed. It was not the question of model, but of machinery and material—perhaps more of material than has been generally allowed. What mild steel has done in the past in the lightening of ships and the heightening of speed, we may expect to see nickel steel do—perhaps to an even more striking degree—in the future. But it must be much cheapened first. Who shall say what developments in structural matters we may see within the next ten years, when we remember that twenty years or so ago there was not a single vessel being built of steel?

The Lake Carriers' Association is now considering the lake trip of the rivers and harbors committee to be taken shortly after congress adjourns. It is quite likely that the North Land, the beautiful twin-screw steamer of the Northern Steamship Co.'s fleet, will be placed at the disposal of the congressional committee. The cruise upon this steamship from Duluth to Buffalo and return could be made in about ten days and still permit of stops in Cleveland and Detroit, as well as in all the important channels of the Detroit, St. Clair and St. Mary's rivers. In this way the members of the committee could obtain a comprehensive understanding of the enormous character of lake traffic and the immensity of lake interests. The association is now in correspondence with Representative Burton, chairman of the committee of rivers and harbors, upon the subject.

According to the present program the battleship Ohio will be launched at the yards of the Union Iron Works, San Francisco, in November and the Ohio society of California is already alive to the occasion. It is estimated that there are 25,000 Ohioans in California and every mother's son of them has received a circular urging him to attend the launching. Committees on transportation, badges, reception and organization have been appointed. It has been gravely announced that the Ohio is bigger and better and more formidable than any other battleship in the United States navy—and altogether the Ohio spirit is visible in every line. It is pointed out that the Ohio is 40 feet longer than the Oregon, has 2,000 tons greater displacement and a speed greater by three knots.

More than one-third of the marine engine power produced in the United Kingdom in 1899 was credited to the Clyde. Yet the Clyde did not show the largest individual total last year. First place among British marine engine builders was occupied by Messrs. A. Laing & Co., Wallsend-on-Tyne, with 67,600 indicated horse power; the second by Messrs. Harland & Wolff, Belfast, with 66,150, and third place by Messrs. John Brown & Co., Limited (late Clydebank Ship Building & Engineering Co.) Glasgow. The world's record, however—88,300 indicated horse power—is held by the Vulcan Co. of Stettin, Germany, who were also third on the list of ship builders.

In the matter of materials, if we exclude the United States and Canada, there were probably not 10,000 tons of wood or "composite" vessels built in all the maritime countries during 1899. The proportion of such is not more than 0.1 per cent of the new tonnage. On the other hand, 98.8 per cent. of the new tonnage last year was of steel and 1.1 per cent. of iron. The new iron vessels were all of small tonnage, and consisted of steam trawlers and such like craft. We are, in fact, in the steel age of ship building. Never before in the world's history was so much steel required as in 1899.

Oelrichs & Co., New York agents for the North German Lloyd Steamship Co., inform the Review that the statement to the effect that a vessel of 756 feet length, larger than anything now afloat, was contemplated for the North German Lloyd fleet is an exaggeration. The company has given orders for the construction of two new fast twin-screw passenger steamships, the one being 665 feet and the other approximately 706 feet in length, but further particulars in regard to these vessels are not obtainable at present.



## NEWS FROM BOTH COASTS.

## ACTIVITY IN EASTERN AND WESTERN SHIP YARDS CONTINUES—CONSTRUCTION OF OCEAN-GOING TUGS FOR THE TOWING OF BARGES—NEW WORK ON THE PACIFIC.

The towing of barges from port to port, laden with cargoes, has become a considerable industry on the coast and has called for the construction of powerful tugs. The latest of these tugs to go into commission is the *Buccaneer*. A mate to her, the *Tormentor*, is about ready for service. The *Buccaneer* is a fine specimen of a seagoing tug. She was built in the yard of the Atlantic Works, East Boston, Mass. She is 127 feet long over all, 23 feet beam and 14½ feet deep. Her hull is of wood, of heaviest construction and possesses fine lines. The engine is of the compound variety and boiler of the Scotch type. She was built for the Red Star Towing & Wrecking Co., Boston, and is engaged in service between New England ports and ports south.

Transfer tug No. 13, of the New York, New Haven & Hartford Railroad, recently built by the Bath Iron Works, is proving very successful at her work in New York harbor. Besides giving excellent satisfaction in general, she has lowered the record of transporting cars between Harlem river and Jersey City by fully one-half hour. This tug boat and her sister ship, Transfer No. 14, have boiler power 60 per cent. in excess of the power of the propelling engines, and to this fact alone is due a vast portion of her success as a rapid and powerful steam tug.

Just as fast almost as one could say Wilmington, Harrisburg and Johnstown the three tugs which were built by the Harlan & Hollingsworth Co., Wilmington, Del., for the Pennsylvania railway were launched. These three tugs are splendid pieces of workmanship. They were quite fully described in the last issue of the Review. Each of them is to have a complete outfit of Blake vertical simplex pumps, including the improved featherweight air pumps.

The Kensington Ship Yard Co. of Philadelphia was granted a charter a few days ago. Nearly all of the incorporators are members or employees of the William Cramp & Sons Ship & Engine Building Co. The corporation has been formed to take over the old plant of the Hillman company, which was recently sold at assignee's sale and is to be operated as a part of the great Cramp ship yard.

The New England Co. at Bath a few days ago launched the barge *Bee*, which was built for the Bee Line Transportation Co. of New York. She is 200 feet long over all, 33.5 feet wide and 18 feet deep. She is of about 900 tons gross measurement. In about two weeks the New England Co. will launch a larger vessel of this kind for the Coastwise Steamship Co. of New York.

The Maryland Steel Co. has received a contract for the supply of 1,500 tons of 50-pound steel rails, together with the necessary fish plates, bolts and spikes for the Jiobu railroad in Japan. The contract calls for the shipment to be made in one lot during June.

Woodall & Co., Baltimore, have the contract to make extensive repairs and alterations in the steamer *Salacia*, purchased in New York by the Sanford & Brooks Co. for service between Sewall's point and Old Point Comfort and Newport News.

The senate passed a measure last week authorizing the rebuilding of the bridge at the Washington navy yard at a cost not to exceed \$275,000, of which \$100,000 is at once available.

Construction work on a new steel wharf will soon be begun at Tampico, Mexico. The wharf will be one of the largest in the world.

The William R. Trigg Co. of Richmond, Va., is estimating for the United States government on two large coal barges.

The Carnegie company has received an order from the Cramp company of Philadelphia for 20,000 tons of tank plates.

## ALONG THE PACIFIC COAST.

In 1901 the Sausalito ferry people expect to have the finest ferry service on the Pacific coast. At the present time the *Sausalito* and *San Rafael* do all the work, but neither of them is up to the requirements of the trade in regard to speed. Taking these facts into consideration the North Pacific Coast Co. has decided to build a vessel that will be second to none in the ferry service in the bay of San Francisco. She will be a double-ender and her speed will not be less than 17 knots. She will be equipped with the latest machinery and electrical apparatus. The Union Iron Works has drawn plans and specifications for the new ferry, and will, in all probability, undertake the work. The *San Rafael* will be given a general overhauling and will be fitted with new boilers.

Hay & Wright of Alameda, Cal., report that business is rushing on the Pacific coast. The firm employs between 300 and 500 men constantly. Mr. Hay is at present in the east inspecting the various shipbuilding plants. "There has been a great revival of shipping and repairing during the past two years," said Mr. Hay. "The Cape Nome rush is principally responsible. Most every available vessel has been sent to the Cape. Schooners are fitted up for carrying passengers and every inch of space is taken. Sailing craft have been withdrawn from the fishing and lumber business until there is hardly any left. I suppose 40,000 people are going there this season."

The California, the pioneer in a line of steamships under construction for the American-Hawaiian Steamship Co., to ply between San Francisco, Honolulu and New York, was launched from the yards of the Union Iron Works last week. Her dimensions are: Length over all, 435 feet; beam, 51 feet; depth, 33 feet; gross tonnage, 6,000; dead weight carrying capacity, 6,250 tons; horse power, 2,200; speed, 10½ knots. Three steamers of the same size are now on the ways at Philadelphia. The American will be launched in thirty days, the Hawaiian a month later and the Oregonian before the end of the year.

It is announced that the Wolff & Zwicker Iron Works of Portland, Ore., has just completed the purchase of the Minor tract of land at St. Johns. The tract embraces about 97 acres and has a splendid water front deep enough to float a battleship. The company is pledged by the bonus to establish a plant costing \$250,000 at St. Johns within two years.

Last Saturday afternoon one of the finest four-masted schooners ever

built on the Pacific coast was launched from the ship yard of Matthew Turner at Benicia, Cal. The vessel is the *Rosamond*, built for Messrs. Williams, Dimond & Co. She will be employed in trade with the Hawaiian islands.

Moran Bros. Co., Seattle, on April 25 laid the keel of one of two 1,100-ton four-masted schooners for the Pacific Clipper line. Each will cost \$60,000 and will be 206 feet long, 42 feet 2 inches beam and 16 feet 7 inches deep.

## AMONG LAKE SHIP BUILDERS.

Assistant General Manager Fitzgerald of the American Ship Building Co. will undoubtedly give some attention to work in all the ship yards of the consolidation, as well as to main office affairs in Cleveland, during the absence of General Manager James Wallace in Europe. These two officials of the big company have worked in close harmony and on very friendly terms since the consolidation was effected. Mr. Fitzgerald's special duties have relation, of course, to the upper lake yards. In the selection of Edward Smith of Buffalo for the presidency of the Buffalo Dry Dock Co. under consolidation control, the officials of the parent company have undoubtedly made a wise choice. As a member of the firm of Brown & Co., Mr. Smith has for years occupied a prominent position in lake shipping circles and he is in touch with everything pertaining to vessels in Buffalo. Then, too, the policy of the ship building consolidation in retaining local management wherever it is possible for the different yards that have been bought up has resulted in general satisfaction. No improvements will be made in the Buffalo works for the present, although a dock much larger than either of the two now in operation will certainly be required later on.

The Collingwood Steel Ship Building & Dry Dock Co. of Collingwood, Ont., is now organized with a paid up capital of \$200,000. Capt. Alex. McDougall having come from Duluth to attend a meeting for that purpose. The following officers were elected: J. J. Long, president; Capt. Alex. McDougall, vice president; Thomas Long, secretary and treasurer; Capt. Campbell and Charles Cameron being the other directors. This is the company that took over the Collingwood dry docks and which secured ship building machinery from the works at Everett, Wash., where the whaleback steamer *City of Everett* was built.

The steel steamer *Harvard*, the first of the fleet of the Pittsburgh Steamship Co. (Carnegie line) to be built, was launched at the Wyandotte yard of the Detroit Dry Dock Co., last Saturday. The christening was done by Miss Lillian Taylor, daughter of C. L. Taylor. Mr. Edwin S. Mills, Cleveland representative of the Carnegie company attended the launch. The *Harvard* is the longest ship ever built at the Wyandotte yard. She is 478 feet over all, 50 feet beam and 28 feet deep. She will carry 8,000 tons on 18 feet draught.

The Craig Ship Building Co. of Toledo is now so situated that it can practically build a ship entire. Heretofore the company has built everything except the machinery, but the machine shop that was erected last winter is of a kind suited to all manner of engine work. Another large brick building now nearing completion on the grounds will be used as a foundry. The principal output will be castings for ship building, but, of course, other work will be undertaken in the foundry as well as in the machine shop.

A dispatch from West Superior, Wis., announces that the second dry dock at the works of the Superior Ship Building Co. has been completed. The first vessel to use the dock was the *Nicaragua*. This new structure measures 625 feet in length and has 18 feet of water over the sills. The gate is 65 feet wide at the bottom and 66 feet at the top.

Mr. John J. Hill of Marine City, Mich., who has been building wooden vessels at the Morley ship yard at that point for a great number of years past, says he has made no change as yet as far as his relations with the Marine City yard are concerned. He is thinking of going to the Pacific coast and will probably do so during the year.

## NEW STEAMSHIP LINE.

The announcement has just been made that within the next few days there will be incorporated under the laws of New Jersey the Royal Ulster Steamship Co. The company will be limited. It purposes to run a line of fast freight steamships between New York and Liverpool and soon after the opening of this line to run branch lines to Havana, Santiago, Porto Rico and Venezuela. The company will be capitalized at \$5,000,000. Horace Gould of New York, Louis Daly of Jersey City and M. W. Baldwin of New York are the incorporators. The line purposes to have two sailings each week between New York and Liverpool. New York, Montreal and English capitalists are interested in the company. The vessels of the company will fly the British flag. The new company, so soon as the New York and Liverpool line has begun operations, is to establish a line between Boston and Liverpool. This is, however, contingent on the approval by the Massachusetts legislature of the lease of the Boston & Albany Railroad by the New York Central Railroad. It is understood that Boston & Albany interests are identified with the new steamship line. It was stated at the New York office that twelve vessels have been chartered and a number of vessels have been inspected for the purpose of outright purchase. The names of the steamships chartered or to be prospectively bought would not be told. It is said that a number of them are in the Transvaal service.

A great display of wood working machinery is being made at the Paris exposition by J. A. Fay & Co. and the Egan Co. of Cincinnati. These concerns will show in operation complete equipments on the American plan for car shops, railroad shops, arsenals, ship yards, furniture factories, chair factories, joinery shops, saw and planing mills, and in fact all machines for working wood, complete and in the most improved American state of the art. Competent parties are in charge to show what each machine will do. A complete band saw mill, which will cut timber in the most improved manner, and which will cut quarter oak and also short wood to the very best advantage, will also be a feature of the exhibit.

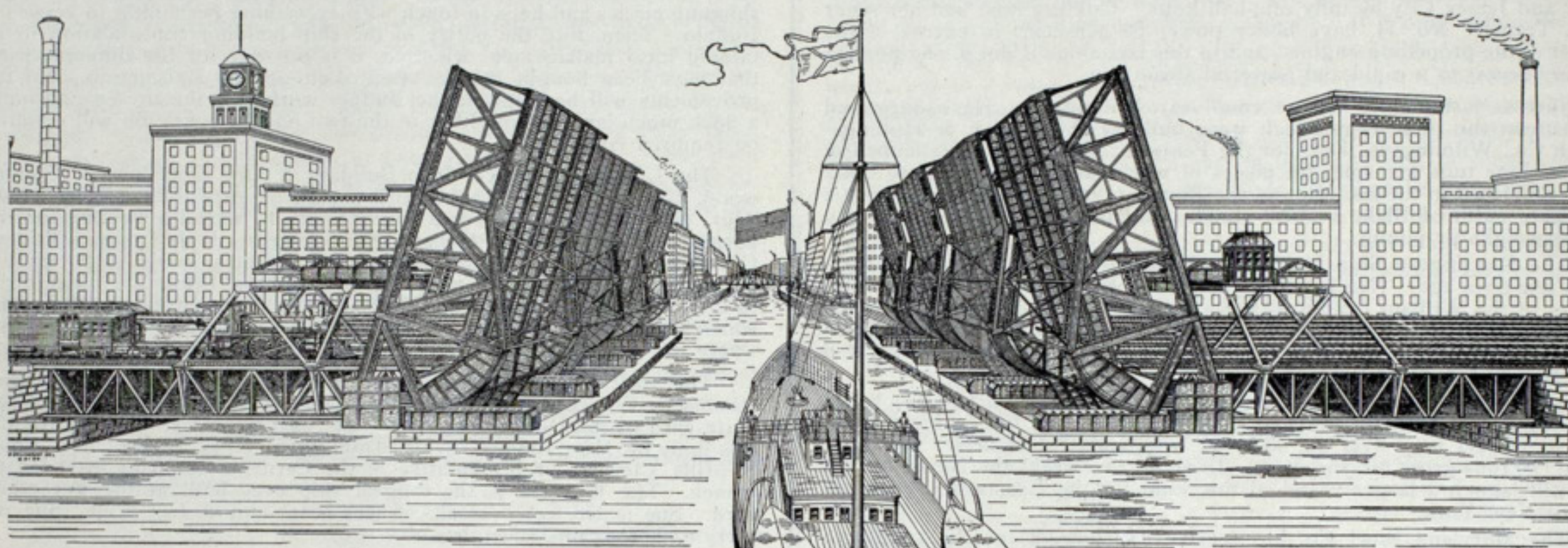


## EIGHT-TRACK BRIDGE ACROSS CHICAGO DRAINAGE CANAL.

The main drainage and ship canal of the Sanitary District of Chicago, forming the connecting link between the great lakes, the Mississippi river and the Gulf of Mexico, was constructed, not only to drain the Sanitary District of Chicago, but also with a view to securing an artificial highway for navigation. To accomplish this purpose, it was necessary that the railroads and highways across the canal be carried by movable bridges. About 2,000 feet west of the junction between the main drainage channel and the Chicago river, virtually in the heart of the city, eight railroad tracks, side by side, cross the line of the canal. Four of these tracks are owned by the Pittsburg, Cincinnati, Chicago & St. Louis Railway, Thomas H. Johnson, chief engineer; two are owned by the Chicago Terminal Transfer Railroad, F. E. Paradis, chief engineer; and two by the Chicago Junction Railway, J. B. Cox, chief engineer. During the early construction of the canal, fixed plate girder spans were provided to carry these railroad tracks across the narrow channel then required for the passage of tugs and scows used in the construction of the canal. A contract was entered into between the interested railroad companies and the Sanitary District of Chicago, under which the sanitary district was to

pier. These piers are each 48 feet wide, and are placed parallel to the center line of the canal. They rest on bed rock, 44 feet below city datum. The piers are not solid; in each pier there are four cavities, which materially reduce the amount of the required concrete and masonry.

The contract for the construction of the bridge was entered into on August 10, 1898, but the contractors were greatly delayed in beginning the work because of the delay in diverting the railroad tracks to the temporary trestles. Two trestles were constructed on each side of the site of the bridge. Another temporary trestle has been constructed on the east side to accommodate the increased railroad traffic. The temporary trestles and cofferdams were constructed by the Sanitary District of Chicago. The cofferdams were built on each side of the site of the bridge, and the area covered by the excavation for the new bridge pumped dry. The McArthur Brothers Co. of Chicago had charge of the construction of the substructure, together with all excavation necessary therefor, and the excavation for the full width of the channel at the site of the bridge. This work was started about May 23, 1899, and extraordinary efforts were made to hurry the completion of the work, so as to permit the opening of the



EIGHT-TRACK SCHERZER ROLLING LIFT BRIDGE AS IT WILL LOOK WHEN COMPLETED.

furnish the railroad companies with an efficient, economical and satisfactory permanent movable bridge, the sanitary district to pay for the cost of constructing the same, and to pay to the railroad companies a sum of money, which, capitalized, would produce an income sufficient to maintain the bridge perpetually.

### STUDYING SOLUTION OF THE PROBLEM.

Extensive studies for the solution of the very difficult problem presented by the large number of railroad tracks to be concentrated on the proposed bridge were made by the engineers of the Sanitary District of Chicago, under the supervision of Mr. Isham Randolph, chief engineer, and Mr. W. M. Hughes, engineer of bridges. A four-track swing bridge had been constructed across the Harlem river, New York city, for the New York Central Railroad. A four-track bascule bridge of the Scherzer rolling lift bridge type had been constructed across the Chicago river and used by the Metropolitan West Side Elevated Railroad for a number of years. No eight-track movable bridge had ever been constructed. A swing bridge wide enough to accommodate the eight railroad tracks was objectionable to the railroad companies interested, because the center pier and protection pier of the bridge would fill a large part of the cross section of the existing channel, and the bridge, when open, would only leave two narrow channels for the passage of vessels, thereby greatly retarding their passage and delaying the very heavy railroad traffic. As all the tracks would be concentrated on one structure were the swing bridge in any manner disabled, especially in the moving mechanism, it would have to be kept open to accommodate navigation until the necessary repairs could be completed, and the entire business of the railroad companies at this point would be "tied up."

It was decided by the sanitary district to invite, by extensive advertisements, competitive designs and bids thereon, for the construction of a movable bridge to best fulfill the requirements of the situation. In response to these advertisements plans were received by the sanitary district from Mr. C. L. Strobel; Mr. Onward Bates, represented by the Edge Moor Bridge Works; Mr. M. G. Schinke, represented by the Milwaukee Bridge & Iron Works; Mr. J. A. L. Waddell, represented by the King Bridge Co.; Messrs. Wilmann and Franzen; Mr. William H. Breithaupt and the Scherzer Rolling Lift Bridge Co. The designs and plans of the Scherzer Rolling Lift Bridge Co. were selected by the sanitary district, and approved by the railroad companies interested, and contracts were entered into between the Sanitary District of Chicago and the Scherzer Rolling Lift Bridge Co. for the construction of the substructure and superstructure of this bridge, as a fixed structure. A contract was also made under which the Scherzer Rolling Lift Bridge Co. were to act as supervising engineers over the construction of the fixed bridge and also the movable bridge when contracts are let for the construction of these additional parts of the bridge. Mr. Ralph Modjeski, member American Society Civil Engineers, was retained as consulting engineer by the railroad companies interested.

### GENERAL DESCRIPTION—THE SUBSTRUCTURE.

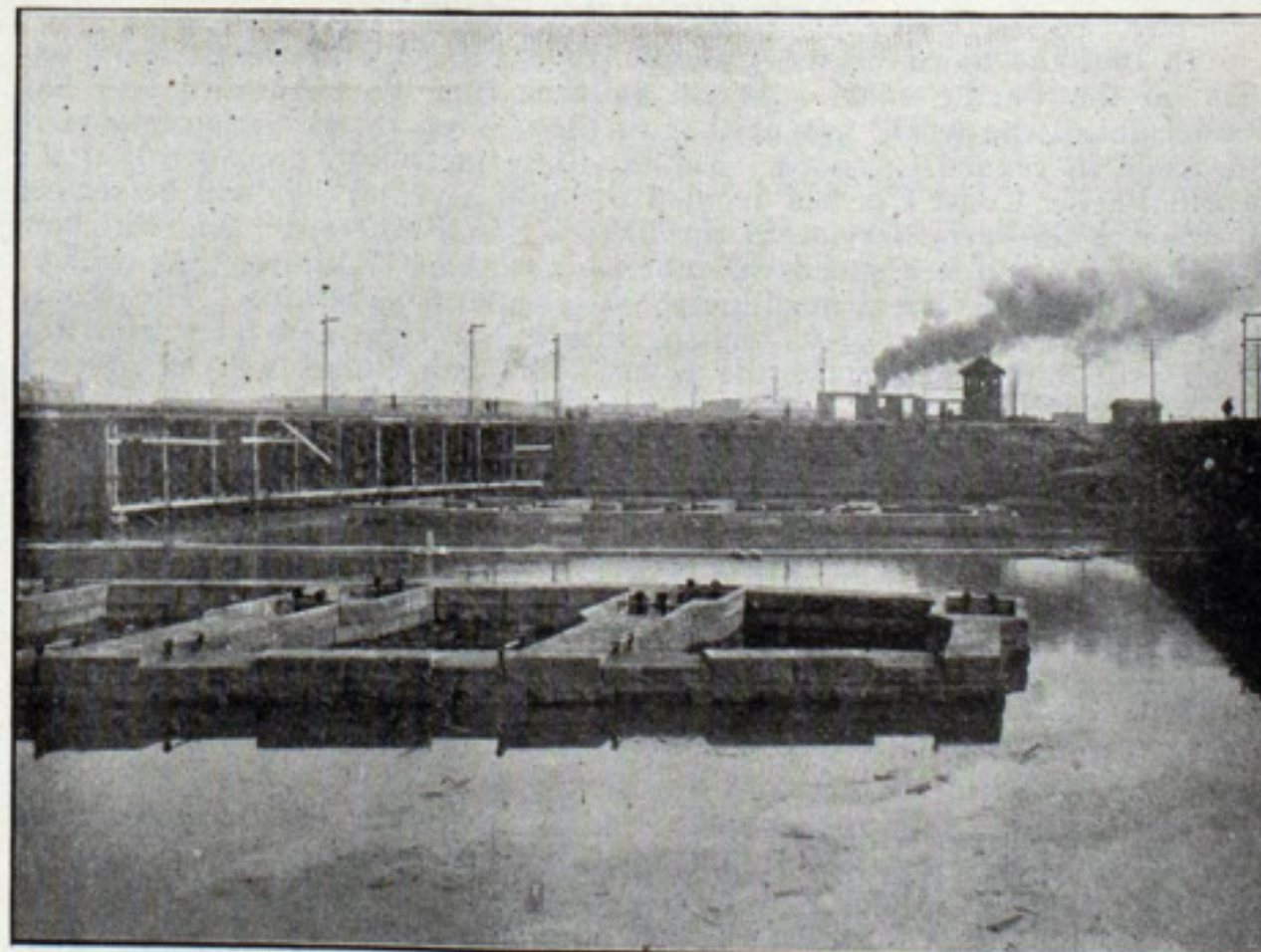
The bridge crosses the channel at an angle of 68 degrees 21 minutes 40 seconds. It provides a clear waterway for navigation of 120 feet between the piers, at right angles to the center line of the canal. On each side of the waterway provided for navigation is placed a main supporting

canal early in January, 1900. The substructure work was carried on both day and night and was completed about Jan. 5, 1900.

The main piers are composed of Portland cement concrete, capped by four 2-foot courses of Bedford stone. The abutments are composed of Portland cement concrete, faced and capped with Bedford stone. The Portland cement concrete was mixed by machinery, and composed of one part of cement, three parts of sand and six parts of broken stone, deposited in layers not exceeding 6 inches in thickness and thoroughly tamped and rammed.

### PARTICULARS OF SUPERSTRUCTURE.

The superstructure of the fixed bridge will be built by the A. & P. Roberts Co. of Philadelphia. The superstructure was designed according to the general specifications of the Scherzer Rolling Lift Bridge Co., in



SUBSTRUCTURE OF THE EIGHT-TRACK BRIDGE IN APRIL, 1900.

conformity with the specifications for railroad bridges of the Pennsylvania lines west of Pittsburg, dated April, 1897, the loading being 5,000 pounds per lineal foot of single track, with a concentrated load of 50,000 pounds at any one point of the track.

The bridge consists of four independent double track Scherzer rolling lift bridges, placed side by side, with a clearance of 6 inches between the adjacent trusses. The spans may be operated either jointly or singly, as desired, by two operators, one on each side of the canal. When the

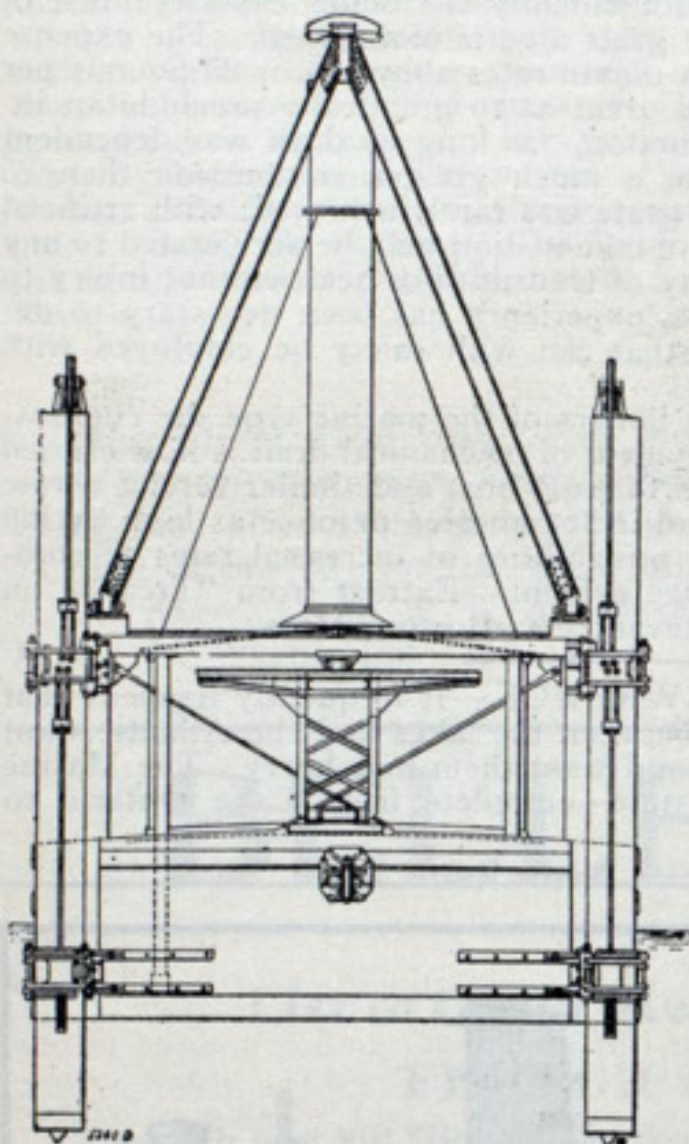


bridge is to be made movable, the track girders, rolling segments, operating struts, machinery supports, machinery and electrical equipment will be added. When it is desired to open the bridge, the center pins are unlocked by means of electrical devices, the spans are then rolled upward and backward upon the track girders. The movable spans are counter-weighted so as to be at rest at an angle of about 40 degrees. This greatly facilitates the opening of the spans, and also aids in closing them. The bridge is to be opened or closed in thirty seconds, by means of four 40 horse-power electric motors on each side of the channel. The electrical motors are controlled by a controller in an operator's house, placed on each side of the channel on the machinery support, at an elevation sufficiently high to command a clear view of the railroad tracks and the channel. A channel back of each of the main piers is provided to give to the canal a capacity sufficient to take the maximum flow of water required for drainage purposes.

### SIX-YARD DIPPER DREDGE.

AN EXCELLENT EXAMPLE OF THE BEST TYPE OF MACHINE OF THIS KIND MADE IN AMERICA—PRODUCT OF THE BUCYRUS CO.

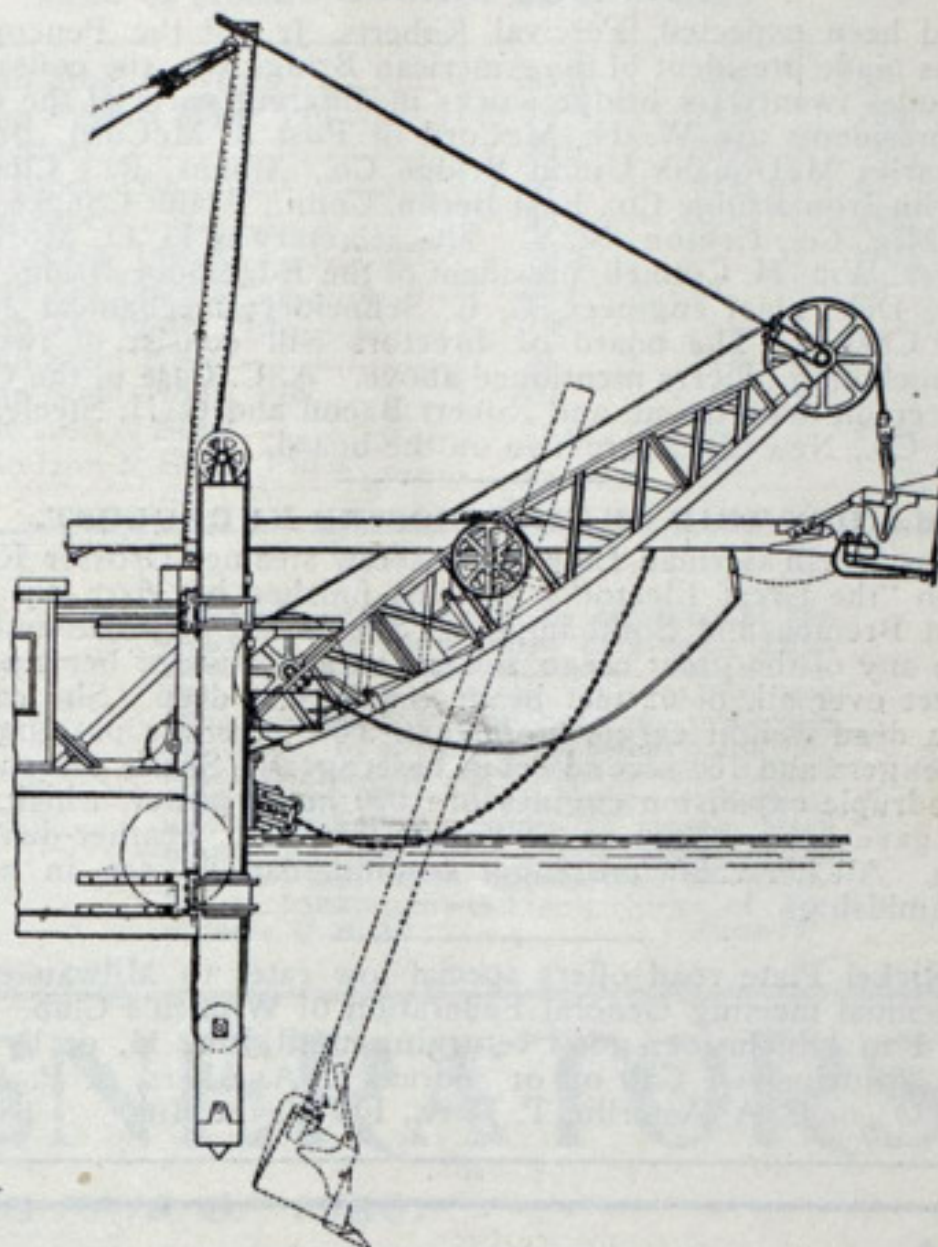
The great reduction in the cost of dredging during the past few years and the low price at which contracts have been taken has been largely brought about by the use of large and powerful dredging machines. Some years ago a 3-yard dipper dredge with 12-inch by 16-inch hoisting engine was considered advanced practice, but now they are built with 18-inch by 24-inch engines and a 10-yard dipper. Even this size is likely to be increased.



The dredge illustrated in this article, and which was built by the Bucyrus Co. of South Milwaukee, Wis., is an excellent example of a modern dipper dredge. The hoisting gear is on the direct wire rope system; the chain system of hoisting answers very well for smaller dredges, but for high power and speed hoisting chain becomes too large and cumbersome. The Bucyrus Co. has adopted the principle of a single part wire rope, running at slow speed over very large sheaves, and to operate which the engines were geared up the necessary amount to give the requisite pull. In the dredge illustrated the hoisting rope is made of extra flexible plough steel,  $2\frac{1}{2}$  inches in diameter, and the engines are 16-inch by 18-inch. The hoisting gears are double for the sake of strength. They are each 9 feet in diameter by 11-inch face and drive a

grooved drum between them of differential diameter, the smaller producing a heavy pull at slow speed when the dipper is on the bottom, and the rope rapidly climbing to the larger diameter for the purpose of hoisting the dipper at speed. The effect of this is that the actual working speed of the dredge is very considerable, and this speed is further aided by the great freedom with which the dipper drops to the bottom and overhauls the wire rope. It will readily be seen that in the three-purchase

The hoisting drum is driven by two powerful band-friction clutches of a special type, designed and patented by Mr. A. W. Robinson. This type of clutch is one which has proved itself peculiarly adapted to the work and its operation has been very successful. Although carrying such a very heavy load, the power can be applied either gradually or instantly at the will of the operator. It is frequently necessary or desirable to slip the friction clutches in order to ease the engines in case they become stalled. The two clutches are both actuated by one steam cylinder attached to the main frame, directly in line with the shaft. The movement of this cylinder is controlled by a very small slide valve and compensating links, so that the motion of the piston follows the motion of a man's hand in operating the lever. There is thus no necessity for any dash pot or oil cylinder, or other restraining mechanism. The two main pistons are keyed fast to the intermediate shaft, but only one of the hoisting gears is keyed to this shaft; the object of this is to allow the gears to accommodate themselves so that each will do half the load. Another specialty in the design is that no space is occupied upon the shaft by sliding collars or



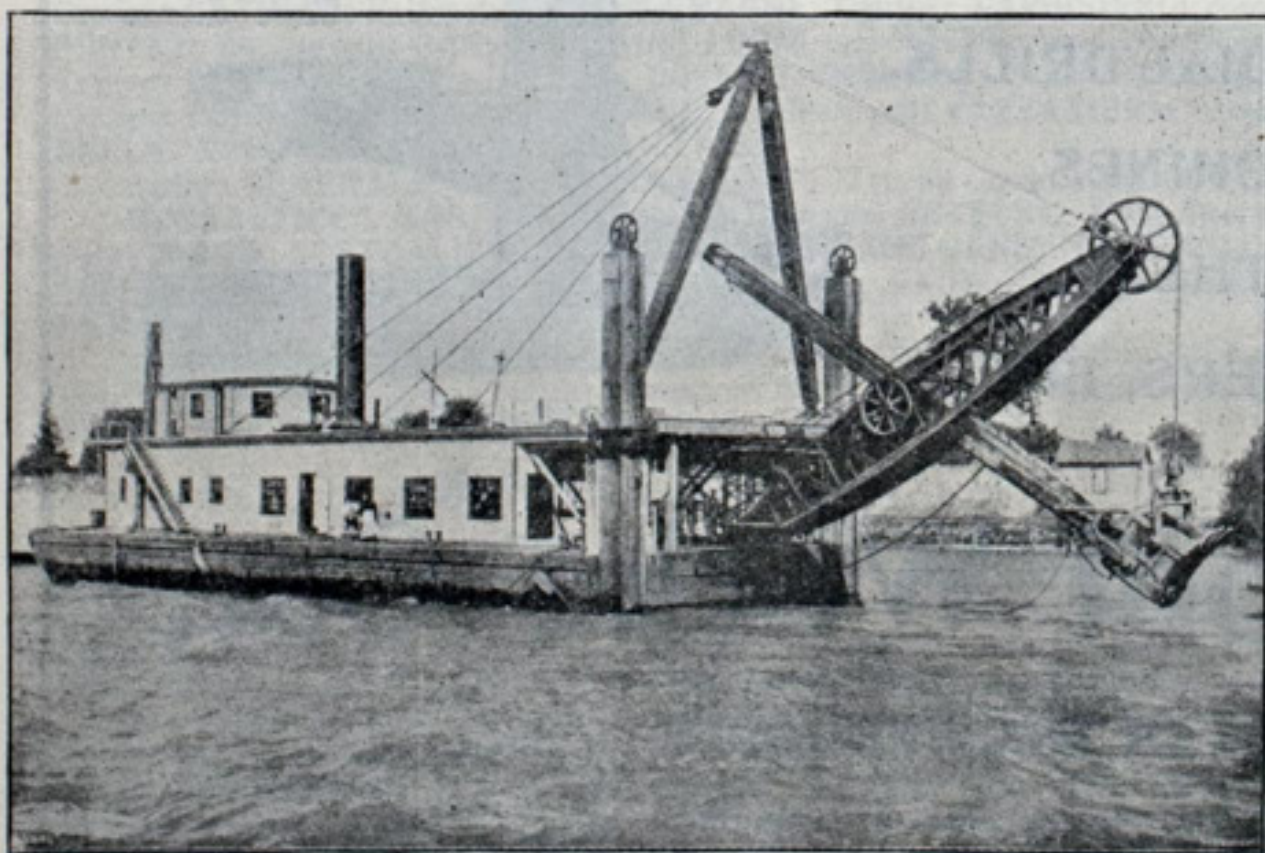
other devices requiring end motion. The hubs of the main hoisting gears are close to the bearings, and the main hoisting drum fits freely between them, and is lined with phosphor-bronze, so as to enable it to run loose upon the shaft.

The illustrations give a good idea of the dredge. It will be seen that all its parts are well balanced and in good proportion. The boom is of steel 50 feet long, and the wire rope sheaves are of cast steel 8 feet in diameter. The A frame is also of steel and is stepped upon the upper deck on top of the spud castings in such a way that when the dredge is pinned up the thrust of the A frame is practically carried upon the spuds and the stresses resulting from it are not transmitted through the hull. The spuds are of Oregon fir, 36 inches square in one stick, 50 feet long. They are likewise operated by wire rope for movement in both directions. There are two ropes to each spud and both ropes are attached to a drum, which is fitted with powerful friction clutch and brake and is operated from the main engines. In this way the entire power of the main engines is available for handling the spuds and for pinning up the dredge. Although the spuds are so large and heavy they can both be raised simultaneously with considerable speed, all the operations of throwing the clutches and brakes being performed by steam. No racks or pinions are attached to the spuds.

The swinging of the boom is effected by independent engines and by wire rope. The engines are geared up in such a way as to give ample power and speed, and the dredge when at work can readily make two dipper loads per minute from a depth of 25 feet. Steam is furnished by one cylindrical boiler of the Scotch marine type, having two corrugated furnaces. The boiler is 10 feet in diameter by 9 feet 6 inches long. The hull is 38 feet wide by 110 feet long by 12 feet deep, and is stiffened by two internal steel trusses. Altogether the dredge is an excellent example of its kind and the details have been very carefully and satisfactorily worked out.

### DESCRIPTIVE OF THE BATH IRON WORKS.

Armstrong & Fears, Harrison Building, Philadelphia, have just published a handsome catalogue and souvenir for the Bath Iron Works of Bath, Me. The book is handsomely bound and finely illustrated, and fully 100 pages are devoted to a complete description of the plant of the Bath company and their facilities for turning out work rapidly and economically. The first part of the book is occupied by an historical sketch of the company; then follows an elaborate description of all the buildings and tools, and the third part describes in detail the general method of building a vessel at Bath. All the principal tools are then illustrated, and after a most complete description of the plant, about thirty pages are artistically covered with pictures of the various types of vessels built by this well-known company. The latter part of the book illustrates the various types of marine engines built at the Bath works. This handsome volume has been arranged and prepared by William A. Fairburn, who was until recently naval architect at the Bath Iron Works.



SIX-YARD DIPPER DREDGE, BUILT BY THE BUCYRUS CO., SO. MILWAUKEE, WIS.

chain dredge the dropping of the dipper must necessarily be slow, as it has to overhaul the long and heavy hoisting chain. In this case the weight of the rope is practically a negligible quantity, and the dipper drops with absolute freedom and great speed, being controlled by a brake at the proper moment. To permit the dipper to drop freely through the water without too great impact, its door is made double with a part of its area opening inwards, so that it can pass through the water in its descent with slight resistance.



## FOUR-POINT BEARING.

Editor Marine Review: Having noted the paper of Mr. Frank Henrich as to "four-point bearing," I send the following, which appears better than his method, as you do not have to move an inch from your present position to determine your distance from a certain point, whether it be abeam, ahead or astern:

To find distance AB from B: Lay out BE at right angles to AB. Produce BE to C, so that EC may be some even fraction, as  $\frac{1}{4}$  or  $\frac{1}{10}$  of BE. Then from C lay out, as before, CD perpendicular to BC, so that DE and A may be in one continued line; then measure CD; then we have  $EC : CD :: BE : AB$ .

Or, in other words, multiply CD by BE and divide by EC and the result will be the distance from B to A. This looks intricate, but try it on a known distance and see how easy it is, and what is more it is absolutely exact.

E. M. HALSEY.

No. 52 William st., New York City.

## AMERICAN BRIDGE CO.

As had been expected, Percival Roberts, Jr., of the Pencoyd Iron Works, was made president of the American Bridge Co., the consolidation which includes twenty-six bridge works in different parts of the country. The vice-presidents are W. H. McCord of Post & McCord, Brooklyn, N. Y.; Charles McDonald, Union Bridge Co., Athens, Pa.; Charles M. Jarvis, Berlin Iron Bridge Co., East Berlin, Conn.; Frank Conger, Groton Bridge & Mfg. Co., Groton, N. Y. The secretary is D. O. Morgan and the treasurer, Wm. H. Connell, president of the Edgemoor Bridge Works, Edgemoor, Del.; chief engineer, C. C. Schneider; mechanical engineer, James M. Christy. The board of directors will consist of twenty-one members, including officers mentioned above. A. C. Case of the Carnegie Steel Co.'s credit department, and Robert Bacon and C. H. Steele of J. P. Morgan & Co., New York, are also on the board.

## MAIDEN TRIP OF THE GROSSER KURFUERST.

The new North German Lloyd twin-screw steamer Grosser Kurfuerst (in English "the Great Elector") has just finished her first trip to New York from Bremen and Southampton. She is not a greyhound, but is faster than any of the great cargo and passenger ships of her class. She is 581½ feet over all, of 62 feet beam and 39 feet deep. She can carry 12,000 tons dead weight cargo, more than 2,000 steerage passengers, 250 cabin passengers and 150 second-cabin passengers. She is driven by two sets of quadruple expansion engines of 8,000 horse power, which, on her trial trip, gave her a speed of 17 knots! She is a weather-defier, with bilge keels. All her cabin passenger accommodations are in a superstructure amidships.

The Nickel Plate road offers special low rates to Milwaukee, Wis., account biennial meeting General Federation of Women's Club. Tickets sold June 1 to 4 inclusive; good returning until June 11, or by deposit until June 30 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 68 June 4.

## ITEMS OF GENERAL INTEREST.

The steam yacht Kanawha made a fast run from New York to New London a few days ago. She covered the distance of 116 miles in 5 hours and 52 minutes. This remarkable performance breaks all previous records, with the exception of that made by the greyhound of the sound, the City of Lowell, the latter vessel holding the record at 5 hours and 32 minutes.

Another large steam icebreaker for Lake Baikal will be sent from St. Petersburg to Siberia on the opening of navigation. The vessel, which was built by the Armstrongs of New Castle, England, will be dispatched by railway in pieces. It is 200 feet long, 57 feet in width, and 4,200 tons displacement.

The Cleveland Marine Review announces that hereafter its regular paper will consist of forty pages and that the subscription price will be increased to three dollars per year. The Review has always endeavored to give full value for its subscription receipts and of late has shown a marked expansion in enterprise.—Marine Journal, New York.

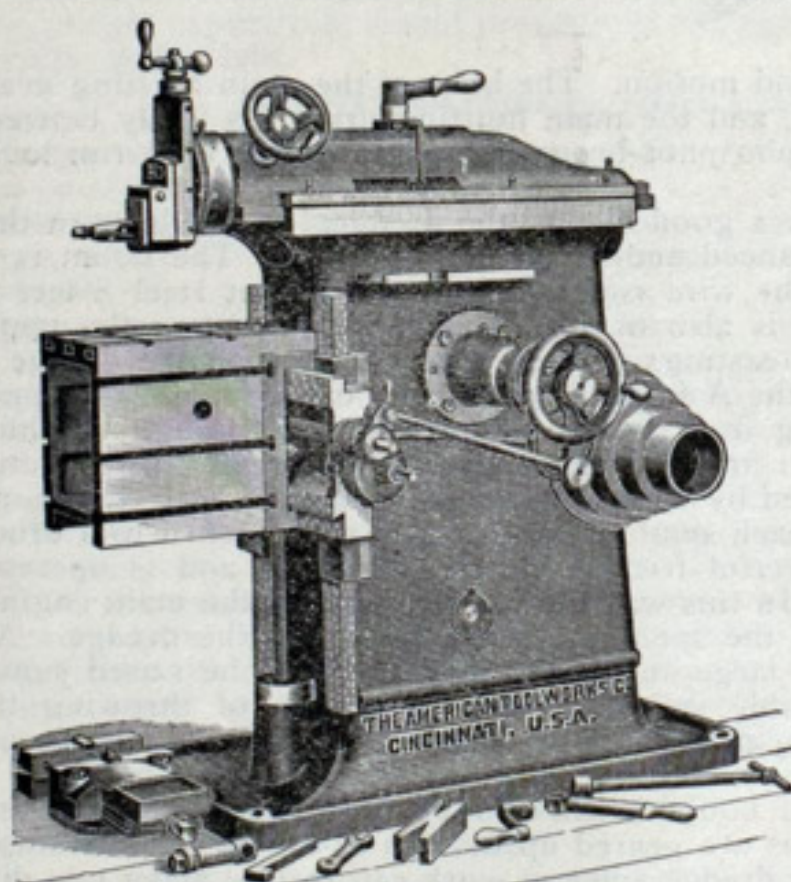
Letters of incorporation have been granted in Canada to the Cramp Ontario Steel Co., Limited. The capital stock is placed at \$5,000,000, divided into shares of \$500 each. Among the incorporators are Charles D. Cramp and William N. Cramp, late of William Cramp & Sons Ship & Engine Building Co. of Philadelphia.

## INCREASED RATE OF COMBUSTION.

Independently of the greater economy and higher rates of combustion, mechanical draft stands as the only means by which the increased rate can be economically obtained. Coincidentally the boiler capacity must of necessity be greater, provided the grate area is maintained. The expense or inconvenience of a chimney, to obtain rates above 20 or 25 pounds per square foot per hour, becomes so great as to practically preclude an increase. As observed by A. J. Durston, "as long as draft was dependent upon a funnel for its production, a much greater combustion than 25 pounds of coal per square foot of grate was rarely achieved; with artificial draft, on the other hand, the rate of combustion may be accelerated to any amount, and as a boiler's capability of transmitting heat without injury to itself is simply a matter of degree, experience has been necessary to determine the rates of combustion that can with safety be employed with different types of boilers."

When it is considered that in boilers of the marine type the combustion rate resulting from the employment of mechanical draft is now carried as high as 40 to 50 pounds, that in torpedo boat and similar service a rate of 70 to 80 pounds is frequent, and in locomotive practice as high as 120 pounds is not at all unusual, the possibilities of increased rates of combustion with mechanical draft are evident.—Extract from "Treatise on Mechanical Draft" by B. F. Sturtevant Co., Boston, Mass.

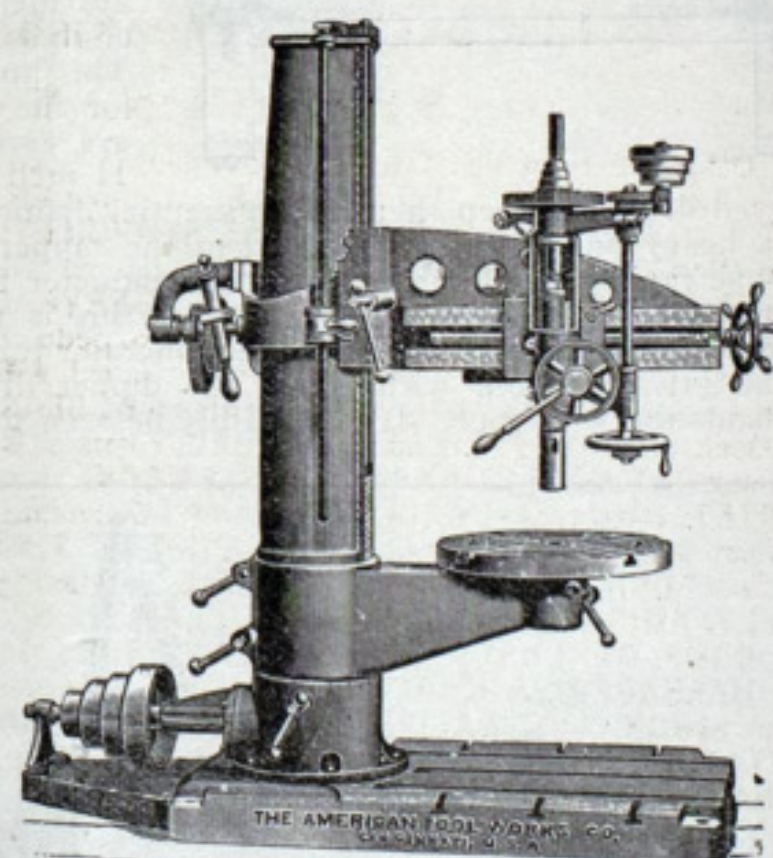
CHARTS OF THE ST. LAWRENCE.—It frequently happens that owners of steam yachts passing between the lakes and the Atlantic want charts of the St. Lawrence river, and want them in a hurry. The Marine Review has them on hand all the time—complete from Lake Ontario to the Gulf of St. Lawrence.



New 16" Back Geared Crank Shaper.

## Machine Tools

LATHES, PLANERS, SHAPERS,  
BORING and TURNING MILLS,  
UPRIGHT and RADIAL DRILLS,  
SCREW MACHINES,  
PULLEY LATHES,  
BOLT CUTTERS, Etc.



3' Radial Drill.

## The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway,  
Geo. Place, Agent.

NEW ORLEANS: The Fairbanks Co.

CHICAGO STORE: 68-70 South Canal Street.

PHILADELPHIA: The Fairbanks Co.

CLEVELAND: The Strong, Carlisle &amp; Hammond Co.

BOSTON STORE: 36 Federal Street.

BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley &amp; Co.

DENVER AND SALT LAKE CITY: The Mine & Smelter  
Supply Co.LONDON: Alfred Herbert, Ltd., 7 Leonard St.,  
Finsbury, E. C.DÜSSELDORF: de Fries & Co., Act. Ges.,  
Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Freres, 33 Rue des Peignes.

BERLIN: de Fries & Co., Act. Ges.,  
Kloster Strasse, 13-15.PARIS: Roux Freres & Cie., 54 Boulevard  
du Temple.

MOSCOW: Alfred Stucken.



## GROWTH OF THE NORTH GERMAN LLOYD FLEET.

The North German Lloyd Steamship Co. will enter the new century with a fleet (including vessels in course of construction) of 101 ocean steamers, twenty-eight river steamers and tugs, and 115 other river craft, with a gross measurement of 496,169 registered tons. The fleet comprises eleven fast steamers, thirteen Imperial mail steamers and thirty-five mail steamers. Out of these twenty-eight have twin screws and thirteen of them have a register of more than 10,000 tons; the aggregate horse power of the engines of the steamers is about 397,010. The Lloyd maintains twenty-two different services. The number of persons in the service of the Lloyd will, after the manning of the new steamers, comprise crews to the number of 9,300 men, and 1900 officials and men employed in the repair works, making a total of 11,200 persons, which figure does not, of course, include the number of cargo workmen at different ports. In the inter-oceanic traffic the Lloyd has transported so far about 3,500,000 passengers. In the course of last year the steamers of the company passed over an aggregate distance of 3,545,000 nautical miles, equal to about 164 times the circumference of the globe.

## NO HELP FROM REDUCING PRICES.

The iron trade is slowing almost to a standstill. An almost entire absence of buying and at the same time a rate of consumption known to be close to the highest, if not the highest, make a combination the trade has never seen. Sellers continue to reiterate that old contracts are nearing the end and that buying on a liberal scale must soon be resumed, but the fact remains that consumers are rigid in their abstention from the market. No development of the past week throws any light on the situation. Prices have gone practically unchanged, while the dullness in all lines has become more pronounced. It appears that few of the inquiries made by bidders as to the success of competitors in getting business are wrong, and that instead of closing elsewhere at a lower price the inquirer simply did nothing. The large steel companies have diagnosed the situation as one not to be helped by reducing prices.—Iron Trade Review.

The Nickel Plate road offers low rates to Des Moines, Ia., account annual convention Music Teachers' Association. Tickets good going June 17 to 21 inclusive, and good returning not later than June 23, 1900, at one fare for the round trip. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 83 June 14.

## IN THE LAKE COUNTRY

of Northern Illinois, Wisconsin, Minnesota and Michigan there are hundreds of the most charming summer resorts awaiting the arrival of thousands of tourists from the south and east. Among the list of nearby places are Fox lake, Delavan, Lauderdale, Waukesha, Oconomowoc, Palmyra, the Dells at Kilbourn, Elkhart and Madison, while a little further off are Minocqua, Star lake, Frontenac, White Bear, Minnetonka and Marquette on Lake Superior.

For pamphlet of "Summer Homes for 1900," or for copy of our handsomely illustrated summer book, entitled "In the Lake Country," apply to nearest ticket agent or address with four cents in postage, George H. Heafford, general passenger agent, Old Colony building, Chicago, May 24.

## VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of May 23, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	35¾	36¾	35	35
American Steel & Wire, Pfd.....	74	74¾	73¾	74½
Federal Steel .....	35¾	36½	34½	34½
Federal Steel, Pfd.....	67	67½	67	67½
National Steel .....	29¾	30½	29¾	30
National Steel, Pfd.....	86½	87	86½	87
American Tin Plate .....	23	24	23	24
American Tin Plate, Pfd.....	75	.....	.....	75
American Steel Hoop.....	21	21½	21	21½
American Steel Hoop, Pfd.....	70	.....	.....	70
Republic Iron & Steel .....	14¾	14¾	14½	14½
Republic Iron & Steel, Pfd.....	.....	.....	.....	.....

Sealed proposals will be received at the Office of the Lighthouse Engineer, Fifth District, Postoffice Building, Baltimore, Md., until 12 o'clock, m., June 14, 1900, and then opened, for furnishing the materials and labor of all kinds necessary for the erection and delivery of the Hooper Island Lighthouse, Md., in accordance with plans and specifications, copies of which, with blank proposals and other information, may be had upon application to W. A. Jones, Lieutenant-Colonel, Corps of Engineers, U. S. A. June 21.

## BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

## FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAUT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAH**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS**, **SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY**, **AMIRAL AUBE** and **MARSEILLAISE**.

COMP. GENERALE TRANSATLANTIQUE: X (type Caen) **LAQUEBOT**. MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH**, **AUSTRALIEN**, **POLYNESIEN**, **ARMAND-BEHIC**, **VILLE-DE-LACIOTAT**, **ERNEST-SIMONS**, **CHILI**, **CORDILLERE**, **LAOS**, **INDUS**, **TONKIN**, **ANNAM**, **ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS**, **CAEN**, **BREST**, **CHERBOURG**; Fast Steamers **TAMISE**, **MANCHE**, **FRANCE**.

## RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE**.

## ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR**, **ARROGANT**, **FURIOUS**, **VINDICTIVE**, cruisers; **NIOBE**, **DIADEM**, **ANDROMEDA**, **EUROPA**, cruisers; **CANOPUS**, **GLORY**, **GOLIATH**, **ALBION**, **OCEAN**, iron clad ships; **ARGONAUT**, **ARIADNE**, **AMPHI-**

**TRITE**, **SPARTIATE**, **HERMES**, **HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY**, **ABOUKIR**, **SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE**, **FORMIDABLE** and **IRRESISTIBLE**, **VENERABLE**, **LONDON**, **BULWARK**, iron clad ships; **EURYALUS**, **BACHANTE**, cruisers; **MUTINE**, **RINALDO**, **SHEARWATER**, sloops; **CORNWALLIS**, **DUNCAN**, **EXMOUTH**, **RUSSEL**, iron clad ships; **DRAKE**, **KING ALFRED**, **LEVIATHAN**, **AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX**, **KENT**, cruisers; **ALBEMARLE**, **MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

## AUSTRIAN NAVY.

**BUDA-PEST**, iron clad coast guard; **KAISER KARL VI**, cruiser; **X'**, **X''**, battleships.

## ITALIAN NAVY.

**VARESE**, cruiser; **BENEDETTO BRIN**, battleship.

## ARGENTINE REPUBLIC.

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## SPANISH NAVY.

**REINA REGENTE**, cruiser.

## CHILIAN NAVY.

**O'HIGGINS**, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

## JAPANESE NAVY.

**SHIKISHIMA**, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **TZUMO**, cruiser.

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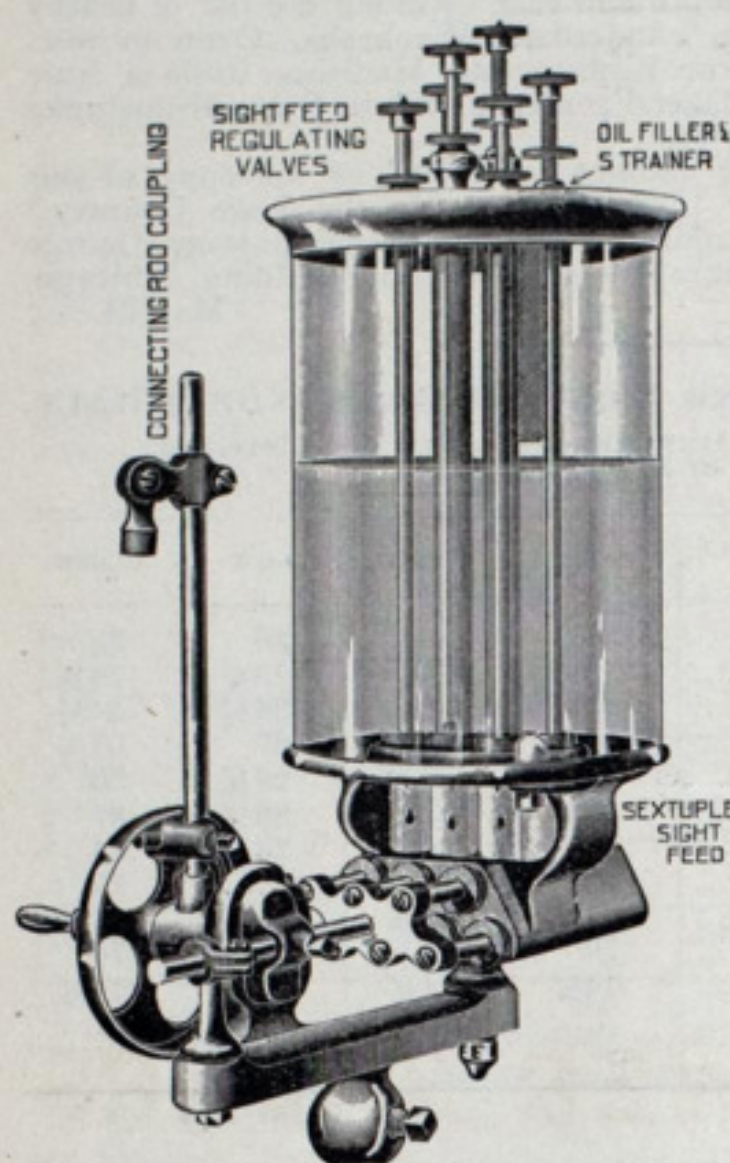
Cable Address: BELLEVILLE SAINT-DENIS-SUR-SEINE.

General Information Sent on Demand.



## NEW SIX-FEED AUTOMATIC OIL PUMP.

Manzel Bros., No. 87 Van Rensselaer street, Buffalo, N. Y. have received orders for several of their six-feed oil pumps from the Worthington Co., London, to be placed on pumping engines at the Paris exposition. A view of the pump is given herewith.



Six pumps are yoked to a common piston rod below the oil tank, and each has a separate sight feed and regulating valve at the top of the tank, so that a different amount of oil may be fed from each pump if desired, the variation being made in the quantity of oil supplied to the various pumps from the common tank. The utility of this device on machines which vary greatly in the use of oil, will be readily perceived. The Manzel pump is receiving marked favor from a large number of concerns in this country, but this is the first occasion on which it has been selected as a part of an exposition exhibit.

Among users of this pump well known to readers of the Review are the Tonawanda Iron & Steel Co., Tonawanda, N. Y., Carnegie Steel Co., Calumet & Hecla Mining Co., Snow Steam Pump Co. of Buffalo, and Hingston & Woods, dredging contractors also of Buffalo. Circulars

dealing with sizes, prices, etc., will be furnished upon application to the manufacturers.

Joseph A. Donohoe, W. J. Dutton, C. de Guigne, E. E. Kentfield and A. M. Simpson have incorporated the Mission Rock Co. and the San Francisco Dry Dock Co. The former corporation is capitalized for \$1,500,000, of which \$2,500 has been subscribed, and the dock company for \$300,000, of which \$500 has been subscribed. The company proposes purchasing Mission Rock, establishing warehouses, building a dry dock and to carry on a general shipping business.

## ANOTHER EXPERIMENTAL STATION.

The North German Lloyd Steamship Co. has opened a tank for trials of ships' models, or a "towing experimental station" as it is called, at Bremerhaven and has invited the German navy and German ship yards to make use of it. Emperor William visited the station recently and complimented the steamship company on its enterprise. Naval architects know that great outlays are required for such stations; that the first of them was designed by the engineer, W. Froude, for the English Admiralty, and was erected at Torquay. His son, R. E. Froude, built an improved station at Portsmouth. The next was constructed by the Dennys' ship builders of Dumbarton, Scotland. There are now such stations in Holland, Italy, Russia, France, and the United States, all of which, excepting the French station and the station at Washington are modeled after Froude's. The Lloyd station is said to have some improvements over any of the others.

The North German Lloyd station at Bremerhaven covers 2,000 square meters of ground. There is a hall 170 meters long, which includes the model foundry, the machine for shaping the models, the electric storage batteries which supply the towage power, a magazine, workshop, drawing-room and offices. There is also adjoining this hall a filter plant with forty square meters filtering surface to supply water for the towing tank. The tank has an interior length of nearly 160 meters and a depth of 3.2 meters, and is 6 meters broad. It contains 2,900 cubic meters of filtered water. The walls are wooden and are extraordinary stable to prevent oscillation.

In making the towing experiment the practice is the same as in other similar tanks. A paraffine model of the ship to be built is molded and cut according to an approved design. It is then towed by the electric motor, which moves on a track beside the tank, while a dynamometer measures the resistance. The model is cut and recut and remolded time and time again, the displacement remaining the same. The object is to ascertain what length, breadth, depth, height of load line, etc., are best adapted to secure the required speed, loading capacity, and radius of action. The models are  $4\frac{1}{2}$  to 5 meters long. They may be of wood, but paraffine is usually preferred, owing to its being easily shaped. There are formulas to determine the friction offered by the waves and other movements of the surface of the sea, and the results so ascertained are also corrected by experiments in which these movements are simulated. The form of screw is also determined on by similar methods.

U. S. Engineer Office, Customhouse, Cincinnati, O., May 16, 1900. Sealed proposals for hire of one or more Dredging Plants, each consisting of one Dredge, one Towboat and Three Dump Scows, for use on Ohio River, will be received here until 2 p. m., June 15, 1900, and then publicly opened. Information furnished on application. Wm. H. Bixby, Maj., Engrs. June 7.

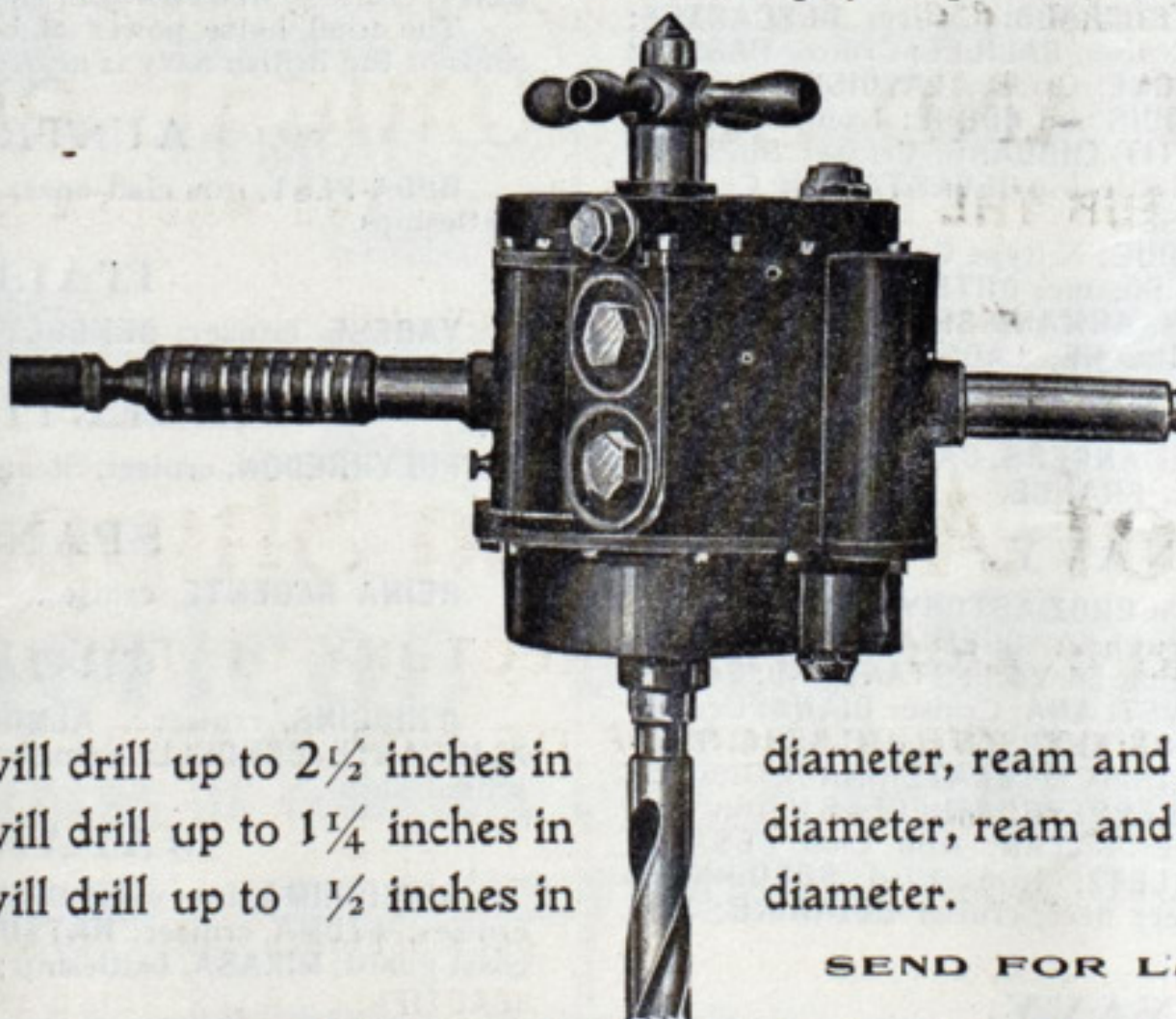
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diameter, ream and tap up to 2 inches.  
diameter, ream and tap up to 1 inch.  
diameter.

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## STANDARD PNEUMATIC TOOL CO.

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141 Broadway, NEW YORK.



## TRADE NOTES.

The Lidgerwood Manufacturing Co., manufacturers of the Lidgerwood standard hoisting engines and cableways, has removed its Cleveland office, Messrs. Kaltenbach & Griess sales agents, from 26 South Water street to the Williamson building.

The Chicago Pneumatic Tool Co. is preparing to give an elaborate exhibit of pneumatic appliances at the convention of the master mechanics and master car builders, to be held at Saratoga in June. Mr. J. W. Duntley, president of the company, who has been traveling in Europe the past several months on business of the company, will return to the United States in time to attend the Saratoga convention. The Chicago company is also making a very extensive display of its products at the Paris exposition.

Mr. Fred. C. Starke, Loan & Trust building, Milwaukee, is meeting with considerable success in the sale of high-grade steam pipe and boiler coverings made by the Sall Mountain Asbestos Mfg. Co. of Chicago. In a letter of recent date J. G. Keith & Co. of Chicago, say of these goods: "The coverings you applied this spring to the boilers and steam pipes of the steamers Parks Foster and Ira Owen are giving entire satisfaction and we gladly recommend your coverings to vessel owners as a means of obtaining economical results in the working of their steamboats. We also desire to say that we are especially pleased with the quality of the material and workmanship."

Ship builders throughout the country are evidently among the best customers of the United States Metallic Packing Co. of Philadelphia. The very neat pamphlet issued by this company recently, and which tells of an output of 12,365 packings in 1899, contains a great number of names that are well known in ship building lines, among them the Bath Iron Works, Hyde Windlass Co., Wm. Cramp & Sons Co., Chicago Ship Building Co., Chas. Hillman Ship & Engine Building Co., American Ship Building Co., Detroit Dry Dock Co., Geo. Lawley & Sons Corporation,

Maryland Steel Co., Moran Bros. Co., James Reilly Repair & Supply Co., W. H. Williams Transportation Co., Newport News Ship Building & Dry Dock Co., Roach Ship Yard, Bethlehem Steel Co., Burlee Dry Dock Co., and Harlan & Hollingsworth Co.

## NEW ORLEANS AS A SHIP BUILDING SITE.

Rear Admiral Endicott, chief of the bureau of yards and docks, and Lyonel Clark, senior member of the firm of Clark & Standfield, designers of the floating dry dock for Algiers, have been in New Orleans lately selecting the site for the dock which is now under construction at the yards of the Maryland Steel Co., Sparrow's Point, Md. It is expected that the dock will be towed to Algiers late in the fall. The thing of interest was the fact that New Orleans impressed Mr. Clark as an excellent site for a ship building plant. A dry dock and a ship building yard usually go together.

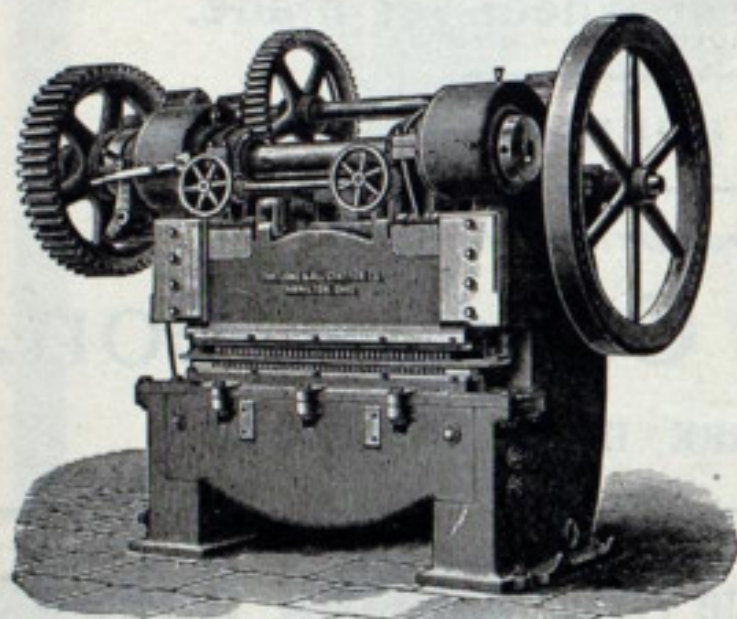
"There isn't a ship building port on the Gulf," said he. "It is ridiculous to think of a vessel having to sail from New Orleans to Newport News, a distance of 1,400 miles, for a few repairs."

Mr. Clark thought a ship building company should be organized at New Orleans and the stock taken by local interests. He referred to the success of the ship yards on the Tyne, where a vessel of 300 feet may be docked, scraped and painted for \$75—the paint, however, being furnished by the ship owners. Mr. Clark was asked to make designs for a prospective private dock, a self-floating steel structure of 7,000 to 10,000 tons, which is being considered by New Orleans parties.

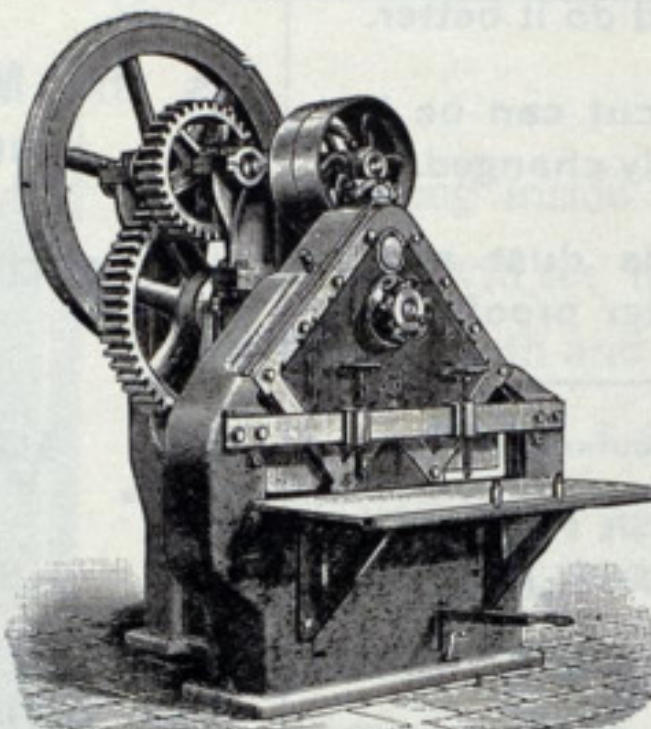
The Nickel Plate road will sell excursion tickets to Philadelphia, Pa., June 14 to 18 inclusive, at one fare for the round trip, account Republican national convention. Tickets are good returning to and including June 26, 1900. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind.

82 June 14

## LABOR SAVING.....



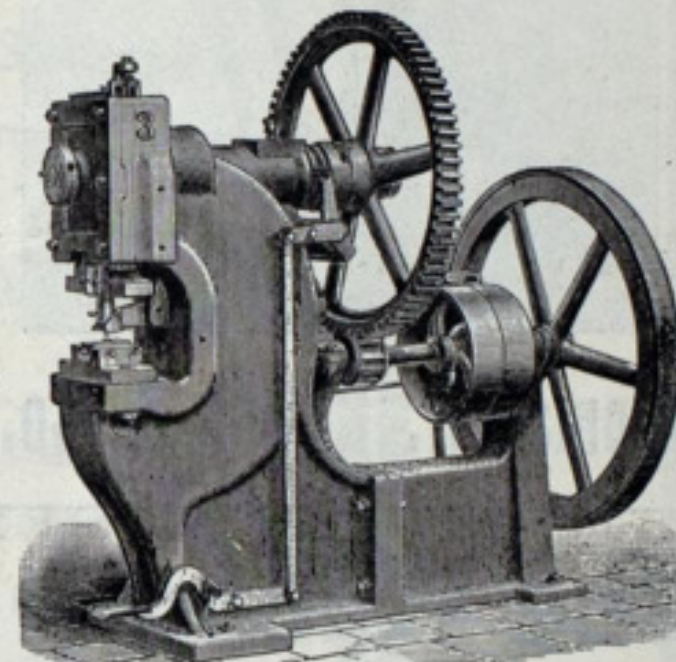
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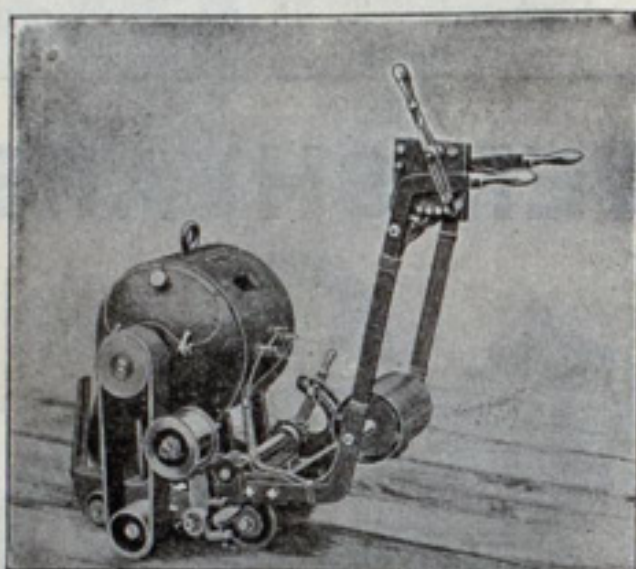


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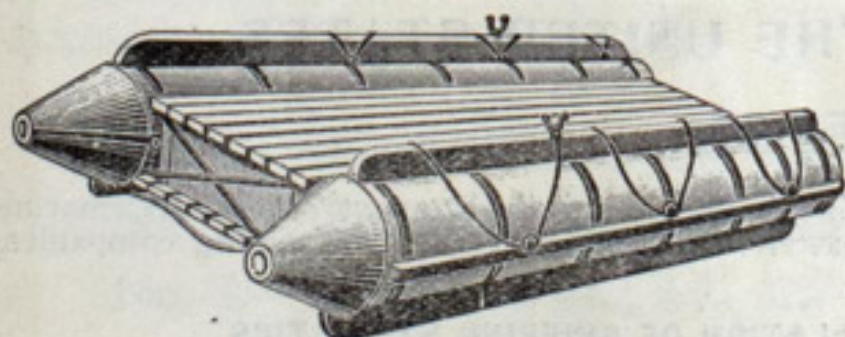
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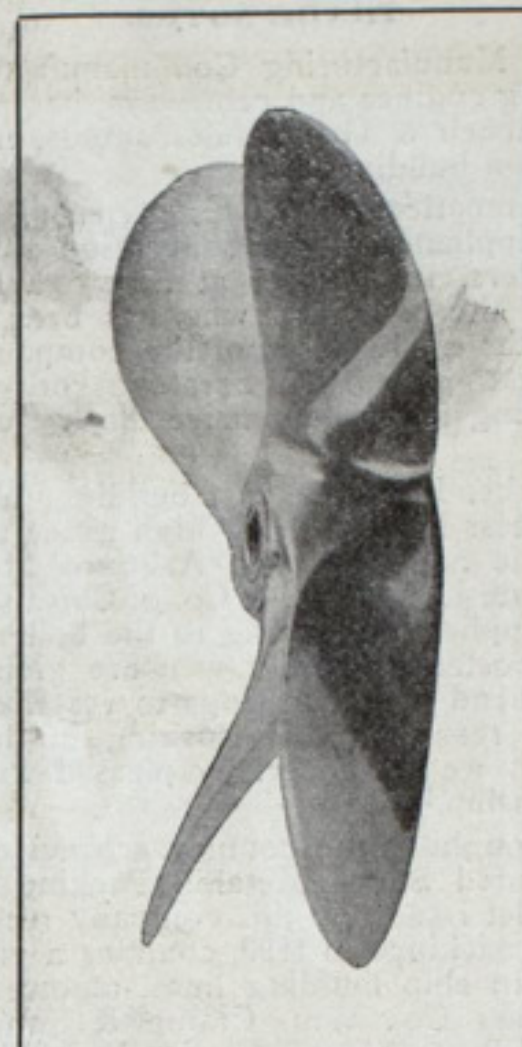
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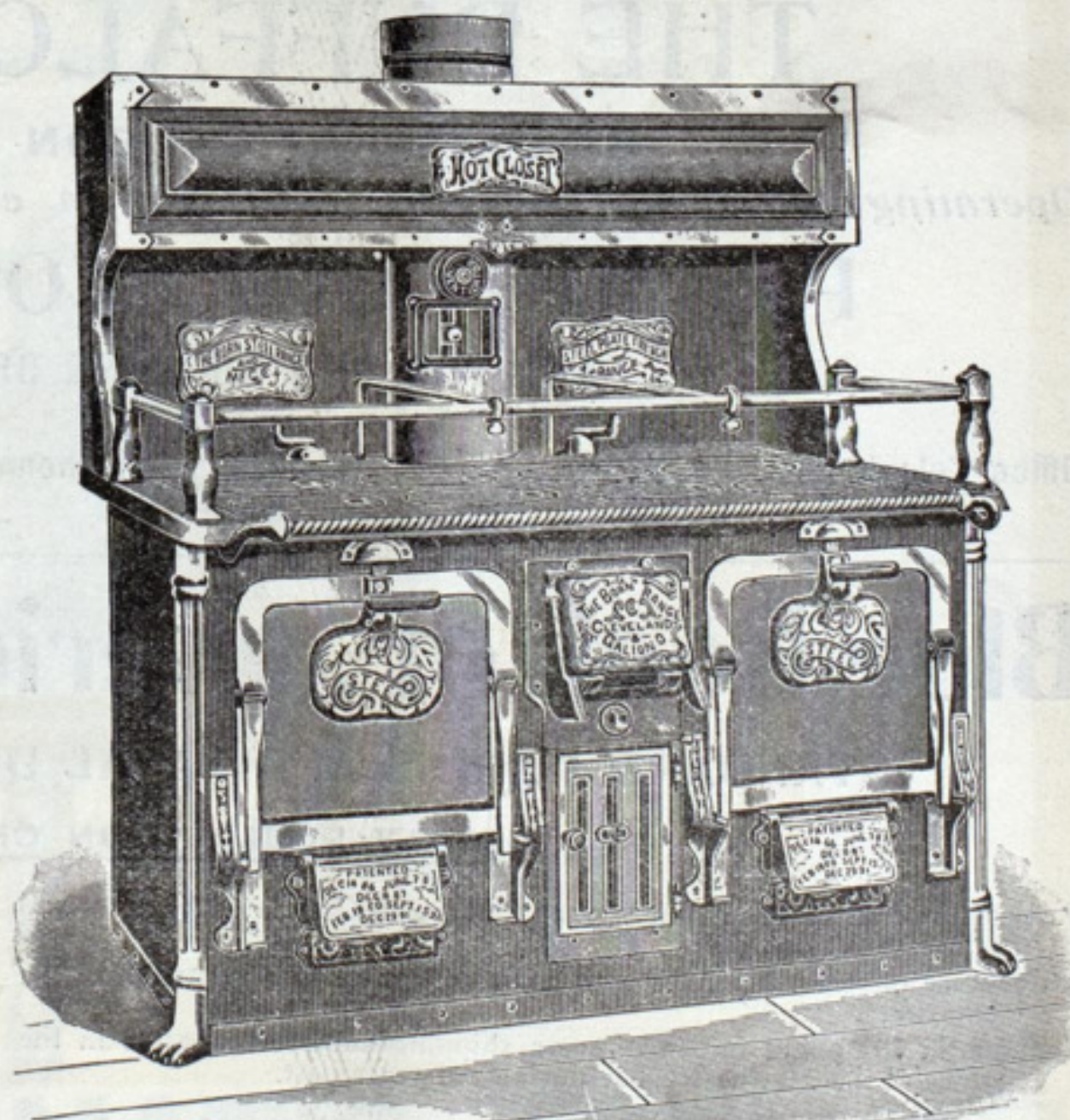
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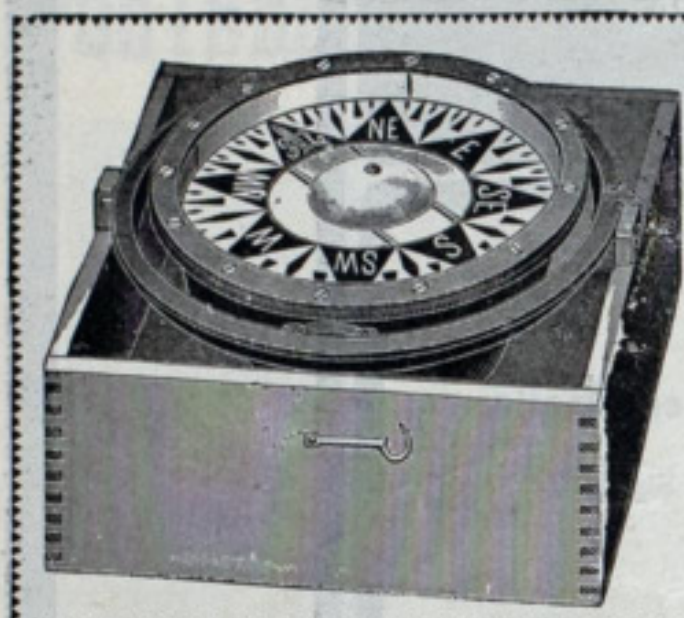
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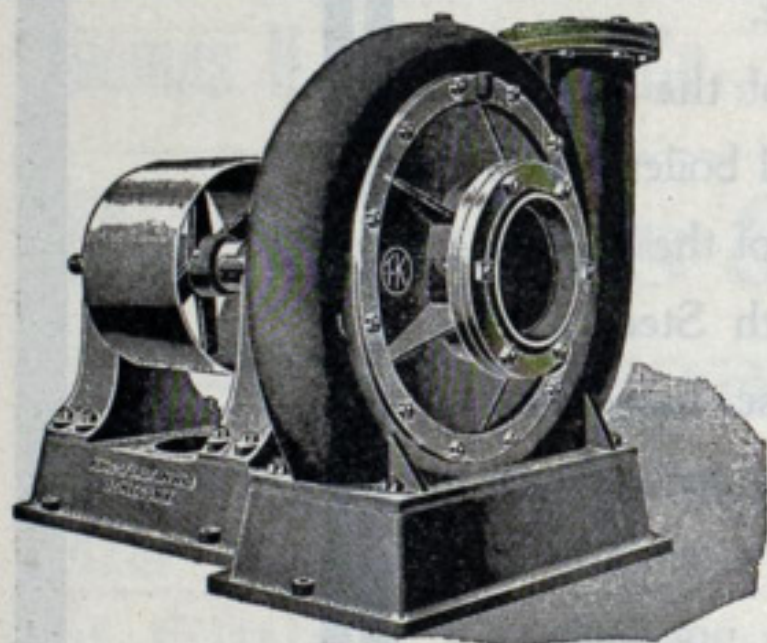


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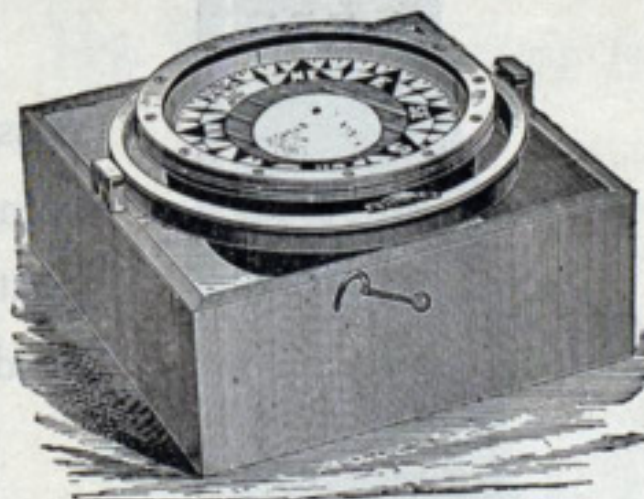
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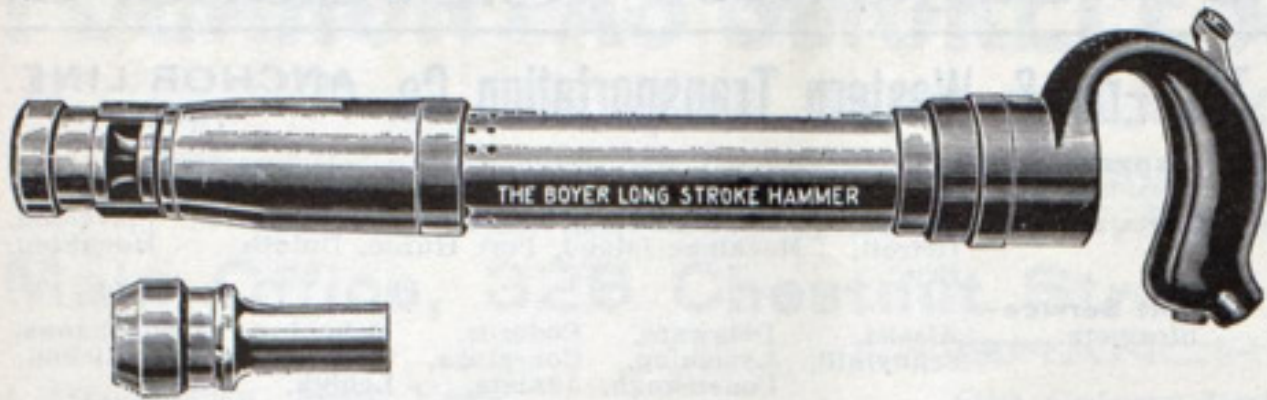
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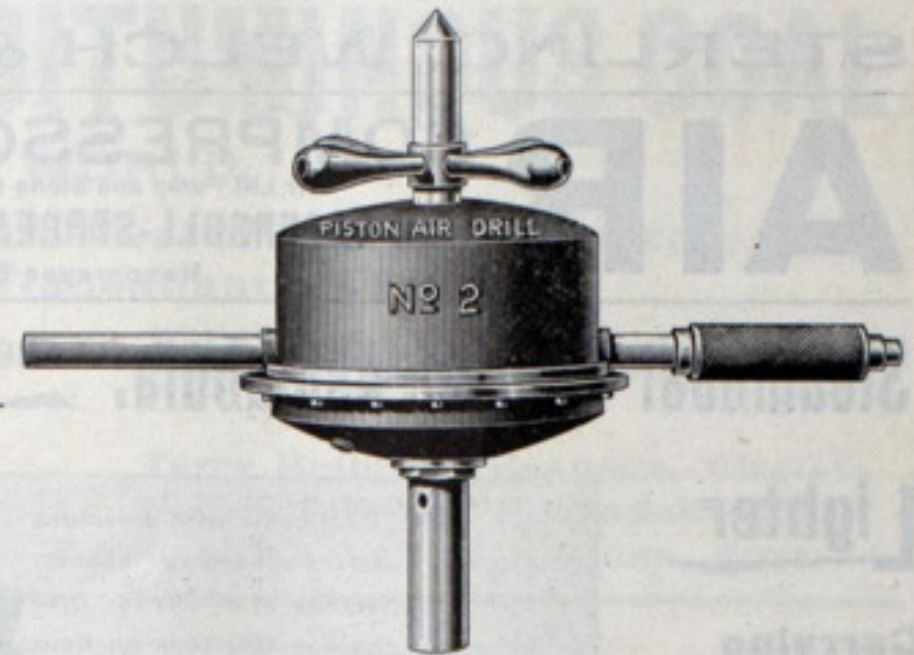
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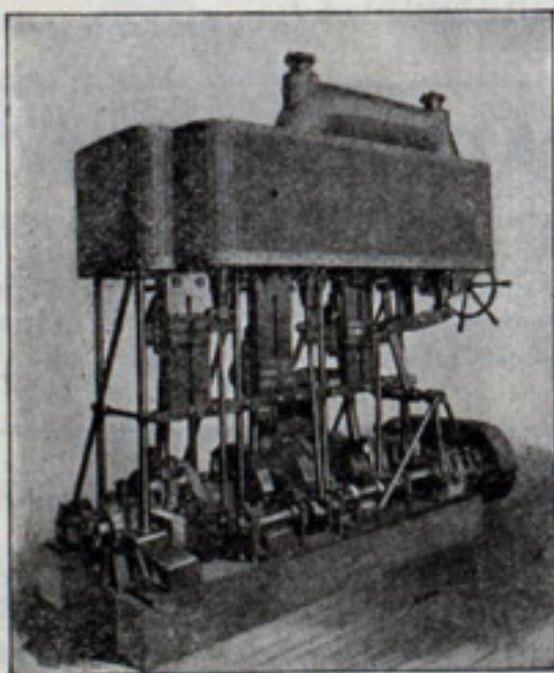
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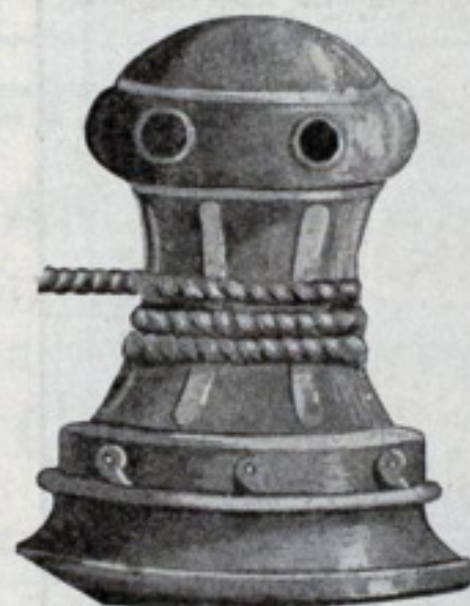
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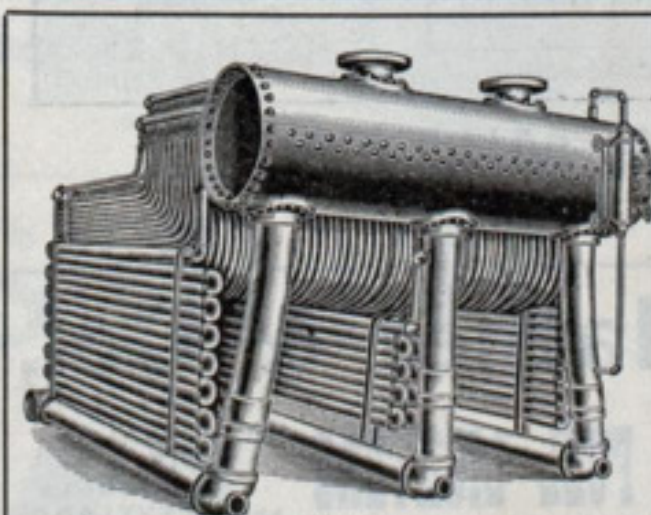
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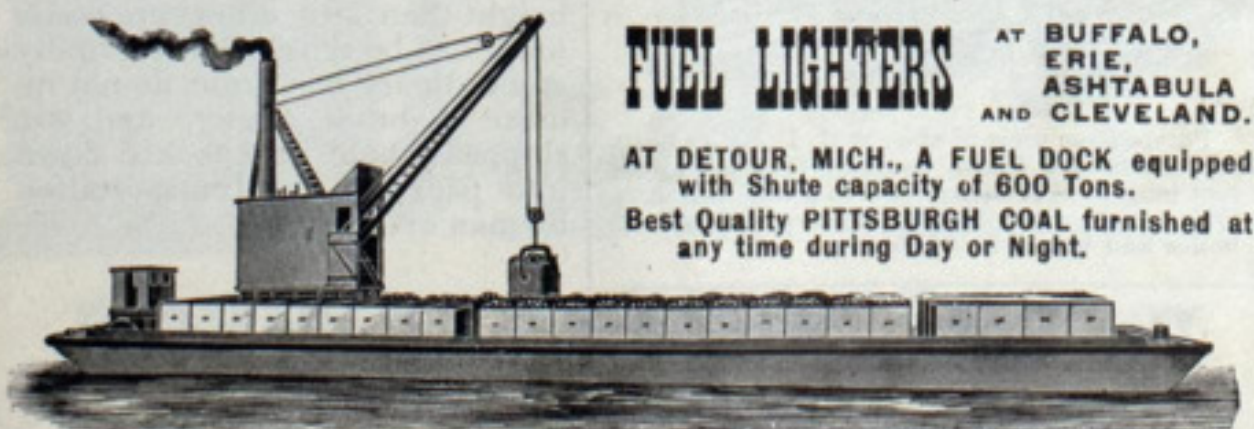
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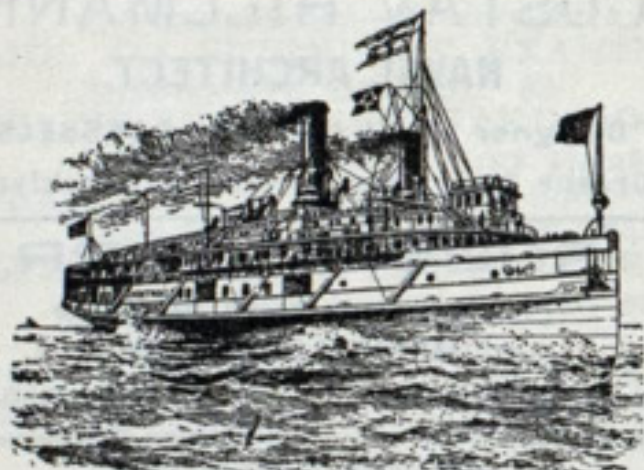
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- MACHINISTS' AND DRAFTSMEN'S HAND BOOK—Peder Lobben. A reference book for all interested in mechanical work. \$2.50.
- MARINE ENGINEERS—Constantine. Just out. \$2.50.
- ENGINES AND ENGINE RUNNING—Joshua Rose. For the use of those who desire to pass an examination to take charge of an engine or boiler; illustrated. \$2.50.
- SMALL ENGINES AND BOILERS—Egbert P. Watson. A manual of concise and specific directions for construction of small steam engines and boilers of modern types; illustrated. \$1.25.
- DRAWING AND DESIGNING FOR MARINE ENGINEERS—Chas. W. Roberts. \$3.
- MARINE ENGINES—R. Murray. \$1.80.
- MARINE BOILERS—L. E. Bertin. 250 illustrations, designs and tables. \$7.50.
- MARINE BOILERS—Triplex. \$1.
- REED'S MARINE BOILERS—H. T. Davis. Second edition, revised and enlarged. \$2.
- BOILERS: MARINE AND LAND—T. W. Traill. For the use of engineers, surveyors, draughtsmen and steam users. \$5.
- MARINE ENGINEERS' RECORD BOOK—Bartley C. Bryan. Designed to contain a complete record of all the parts of a set of marine engines, auxiliary engines, pumps, etc. \$2.
- MECHANICAL ENGINEERS' POCKET BOOK—Wm. Kent. Reference book of rules, tables, etc. \$5.
- RESISTANCE AND PROPULSION OF SHIPS—W. F. Durand, principal of school of marine construction, Cornell University. \$5.



## BUYERS' DIRECTORY OF THE MARINE TRADE.

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by the Marine Review Pub. Co., 418-419 Perry-Payne Bldg., Cleveland.

See accompanying Index of Advertisers for full addresses of concerns in this directory.

### AIR COMPRESSORS, AIR HOISTS, ETC.

Chicago Pneumatic Tool Co.....Chicago.  
Ingersoll-Sergeant Drill Co.....New York.  
Philadelphia Pneumatic Tool Co.....Philadelphia.

### ANCHORS.

Baldt Anchor Co.....Chester, Pa.  
International Anchor Co.....Cleveland.

### ANTI-FRICTION METALS.

Cramp, Wm. & Sons.....Philadelphia.  
Illinois Smelting & Refining Works.....Chicago.  
Magnolia Metal Co.....New York.  
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

### ARTIFICIAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.  
Bloomsburg & Co., H.....Newport News, Va.  
Buffalo Forge Co.....Buffalo.  
Detroit Shipbuilding Co.....Detroit.  
Sprague Electric Co.....New York.  
Sturtevant, B. F. Co.....Boston.

### ATTORNEYS AND PROCTORS IN ADMIRALTY.

Crowl, Samuel H.....Cleveland.  
Gilchrist, Albert J.....Cleveland.  
Goulder, Harvey D.....Cleveland.  
Hoyt, Dustin & Kelley.....Cleveland.  
Pinney, Orestes C.....Cleveland.  
White, Johnson, McCaslin & Cannon.....Cleveland.

### AXLES, SOLID AND HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

### BABBITT METAL.

Cramp, Wm. & Sons.....Philadelphia.  
Illinois Smelting & Refining Works.....Chicago.  
Magnolia Metal Co.....New York.  
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

### BAROMETERS, MARINE GLASSES, ETC.

Bliss, John & Co.....New York.  
Ritchie, E. S. & Sons.....Brookline, Mass.

### BENDING AND STRAIGHTENING ROLLS.

Cleveland Punch & Shear Works Co.....Cleveland.  
Long & Allstatter Co.....Hamilton, O.  
New Doty Mfg. Co.....Janesville, Wis.

### BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.  
Cleveland Block Co.....Cleveland.  
Donohue & Co., John T.....Baltimore.

### BLOWERS.

Buffalo Forge Co.....Buffalo.  
Sprague Electric Co.....New York.  
Sturtevant, B. F. Co.....Boston.

### BOAT BUILDERS.

Dreln, Thos. & Son.....Wilmington, Del.  
Electric Boat Co.....New York.  
Gas Engine & Power Co. and Chas. L. Seabury  
& Co., Consolidated.....New York.  
Lane & DeGroot.....Brooklyn.

### BOILER MANUFACTURERS.

Almy Water Tube Boiler Co.....Providence, R. I.  
American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Babcock & Wilcox Co.....New York.  
Bath Iron Works, Ltd.....Bath, Me.  
Boyer Water Tube Boiler Co.....New York.  
Chicago Ship Building Co.....Chicago.  
Cramp, Wm. & Sons.....Philadelphia.  
Dearing Water Tube Boiler Co.....Detroit.  
Delaunay, Belleville & Co.....St. Denis, France.  
Detroit Screw Works.....Detroit.  
Detroit Shipbuilding Co.....Detroit.  
Farrar & Trefts.....Buffalo.  
Fletcher, W. & A. Co.....Hoboken, N. J.  
Fore River Engine Co.....Weymouth, Mass.  
Gas Engine & Power Co.....Morris Heights, N. Y.  
Hardy, John B.....Tacoma, Wash.  
Harlan & Hollingsworth Co.....Wilmington, Del.  
Hodge, S. F. & Co.....Detroit.  
Iowa Iron Works.....Dubuque, Ia.  
Jenks Ship Building Co.....Port Huron, Mich.  
Kingsford Foundry & Machine Works.....Oswego, N. Y.  
MacKinnon Mfg. Co.....Bay City, Mich.  
Maryland Steel Co.....Sparrow's Point, Md.  
Moran Bros. Co.....Seattle, Wash.  
Morse Iron Works & Dry Dock Co.....Brooklyn.  
Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.  
Newport News Ship Bldg. Co.....Newport News, Va.  
Nixon, Lewis.....Elizabeth, N. J.  
Pusey & Jones Co.....Wilmington, Del.  
Risdon Iron Works.....San Francisco.  
Roberts Safety Water Tube Boiler Co.....New York.  
Stirling, The Co.....Chicago.  
Trigg, Wm. R. Co.....Richmond, Va.  
Union Iron Works.....San Francisco.  
Wolff & Zwicker Iron Works.....Portland, Ore.

### BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

### BOILER COMPOUND FEEDER.

Hall Compound Feeder Co.....Chicago.

### BOILER TUBES, SEAMLESS, WELDLESS— Steel, Brass and Copper.

Atlantic Tube Co.....Pittsburg.  
Hungerford Brass & Copper Co.....New York.  
Shelby Steel Tube Co.....Cleveland.

### BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

### BOILER RIVETS.

Bourne Fuller Co.....Cleveland.  
Champion Rivet Co.....Cleveland.

### BOILER STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

### BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.

### BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati.  
Bement, Miles & Co.....Philadelphia.

### BRASS AND BRONZE CASTINGS, SHEETS, RODS, ETC.

Cory, Chas. & Son.....New York.  
Cramp, Wm. & Sons.....Philadelphia.  
Illinois Smelting & Refining Works.....Chicago.  
Magnolia Metal Co.....New York.

### BRIDGES, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.  
Scherzer Rolling Lift Bridge Co.....Chicago.

### BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co.....Cleveland.  
McMyler Mfg. Co.....Cleveland.  
Webster, Camp & Lane Machine Co.....Akron, O.

### CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

### CAPSTANS.

American Ship Windlass Co.....Providence, R. I.  
Hyde Windlass Co.....Bath, Me.

### CHAINS.

Lebanon Chain Works.....Lebanon, Pa.  
Monongahela Iron & Steel Co.....Pittsburg.  
Standard Chain Co.....Pittsburg.

### CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

### CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.

### CIRCULATOR EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

### CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.  
Bliss, John & Co.....New York.  
Chelsea Clock Co.....Boston.  
Ritchie, E. S. & Sons.....Brookline, Mass.

### COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.  
Hanna, M. A. & Co.....Cleveland.  
Pickands, Mather & Co.....Cleveland.  
Pittsburg Coal Co.....Cleveland.  
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.  
Scott Co., W. L.....Erie, Pa.

### COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co.....Cleveland.  
Lidgerwood Mfg. Co.....New York.  
McMyler Mfg. Co.....Cleveland.

### COMPASSES.

Bliss, John & Co.....New York.  
Ritchie, E. S. & Sons.....Brookline, Mass.

### COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

### COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

### CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.  
Kahnweiler's Sons, D.....New York.  
Lane & DeGroot.....Brooklyn.

### CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co.....Cleveland.  
Donohue & Co., John T.....Baltimore.  
General Electric Co.....Schenectady, N. Y.  
Lidgerwood Mfg. Co.....New York.  
McMyler Mfg. Co.....Cleveland.  
Sprague Electric Co.....New York.  
Westinghouse Electric & Mfg. Co.....Pittsburg.

### CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

### DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

### DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

### DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

### DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.  
Bement, Miles & Co.....Philadelphia.  
Cleveland Punch & Shear Works Co.....Cleveland.

### DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.  
Philadelphia Pneumatic Tool Co.....Philadelphia.  
Standard Pneumatic Tool Co.....Chicago.

### DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

### DRY DOCKS.

American Ship Building Co.....Cleveland.  
Bath Iron Works, Ltd.....Bath, Me.  
Buffalo Dry Dock Co.....Buffalo.  
Chicago Ship Building Co.....Chicago.  
Craig Ship Building Co.....Toledo, O.  
Cramp, Wm. & Sons.....Philadelphia.  
Detroit Shipbuilding Co.....Detroit.  
Harlan & Hollingsworth Co.....Wilmington, Del.  
Maryland Steel Co.....Sparrow's Point, Md.  
Moran Bros. Co.....Seattle, Wash.  
Morse Iron Works & Dry Dock Co.....Brooklyn.  
Newport News Ship Bldg Co.....Newport News, Va.  
Nixon, Lewis.....Elizabeth, N. J.  
Pusey & Jones Co.....Wilmington, Del.  
Townsend & Downey Ship Bldg. Co.....New York.  
Union Dry Dock Co.....Buffalo.  
Union Iron Works.....San Francisco.

### ELEVATORS.

Morse, Williams & Co.....Philadelphia.

### ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.  
Elwell-Parker Electric Co.....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Sprague Electric Co.....New York.  
Sturtevant, B. F. Co.....Boston.  
Westinghouse Electric & Mfg. Co.....Pittsburgh, Pa.

### ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.  
General Electric Co.....Schenectady, N. Y.  
Lidgerwood Mfg. Co.....New York.  
Sprague Electric Co.....New York.  
Westinghouse Electric & Mfg. Co.....Pittsburgh, Pa.

### ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.  
Atlantic Works.....East Boston, Mass.  
Bath Iron Works, Ltd.....Bath, Me.  
Chicago Ship Building Co.....Chicago.  
Chase Machine Co.....Cleveland.  
Cramp, Wm. & Sons.....Philadelphia.  
Detroit Shipbuilding Co.....Detroit.  
Farrar & Trefts.....Buffalo.  
Fletcher, W. & A. Co.....Hoboken, N. J.  
Fore River Engine Co.....Weymouth, Mass.  
Gas Engine & Power Co., and Chas. L. Seabury  
& Co., Consolidated.....New York.  
Giddings & Stevens.....Rockford, Ill.  
Hardy, John B.....Tacoma, Wash.  
Harlan & Hollingsworth Co.....Wilmington, Del.  
Hodge, S. F. & Co.....Detroit.  
Iowa Iron Works.....Dubuque, Ia.  
Jenks Ship Building Co.....Port Huron, Mich.  
MacKinnon Mfg. Co.....Bay City, Mich.  
Maryland Steel Co.....Sparrow's Point, Md.  
Moran Bros. Co.....Seattle, Wash.  
Morse Iron Works & Dry Dock Co.....Brooklyn.  
Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.  
Newport News Ship Bldg Co.....Newport News, Va.  
Nixon, Lewis.....Elizabeth, N. J.  
Pusey & Jones Co.....Wilmington, Del.  
Risdon Iron Works.....San Francisco.  
Roach's Ship Yard.....Chester, Pa.  
Sheriffs Mfg. Co.....Milwaukee.  
Trigg, Wm. R. Co.....Richmond, Va.  
Trout, H. G.....Buffalo.  
Union Iron Works.....San Francisco.  
Wolff & Zwicker Iron Works.....Portland, Ore.

### ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

### ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.  
Hillman, Gustav.....Brooklyn.  
Hunt, Robt. W. & Co.....Chicago.  
Miller, Walter.....Cleveland.  
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.  
Powell, Ambrose V.....Chicago.  
See, Horace.....New York.  
Simpson, W. L.....5th and Buttonwood, Philadelphia.  
Wood, W. J.....Chicago.

### FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.  
Sprague Electric Co.....New York.  
Sturtevant, B. F. Co.....Boston.

### FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.  
Warren Webster & Co.....Camden, N. J.  
Keystone Engine & Machine Works, W. L. Simpson,  
Engineer.....Philadelphia.

### FORGES.

Buffalo Forge Co.....Buffalo.  
Sturtevant Co., B. F.....Boston.

### FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.  
Bourne-Fuller Co.....Cleveland.

### FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

### FLUSHOMETERS.

Kenney, The Co.....New York.

### FURNACES FOR BOILERS.

Continental Iron Works.....New York.



## BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

**FUELING COMPANIES AND COAL DEALERS.**

Castner, Curran & Bullitt (Pocahontas).....  
 ..... Philadelphia.  
 Graham, James & Co.....Detroit.  
 Hanna, M. A. & Co.....Cleveland.  
 Pickands, Mather & Co.....Cleveland.  
 Pittsburgh Coal Co.....Cleveland.  
 Rochester & Pittsburgh Coal & Iron Co.....Buffalo.  
 Smith, Stanley B. & Co.....Detroit.  
 Scott Co., W. L.....Erie, Pa.  
 Youghiogheny & Lehigh Coal Co.....Chicago.

**GAS BUOYS.**

Safety Car Heating & Lighting Co.....New York.

**GAS AND GASOLINE ENGINES.**

McMyler Mfg. Co.....Cleveland.  
 Olds Motor Works.....Detroit.

**GAGES, STEAM AND VACUUM.**

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Crosby Steam Gage & Valve Co.....Boston.

**GRAPHITE.**

Dixon Crucible Co., Joseph... Jersey City, N. J.

**HAMMERS, PNEUMATIC.**

Chicago Pneumatic Tool Co.....Chicago.  
 Philadelphia Pneumatic Tool Co.....Philadelphia.  
 Standard Pneumatic Tool Co.....Chicago.

**HAMMERS, POWER DROP.**

Bement, Miles & Co.....Philadelphia.  
 Chase Machine Co.....Cleveland.

**HEATING APPARATUS.**

Sturtevant Co., B. F.....Boston.

**HOISTS FOR CARGO, ETC.**

American Ship Building Co.....Cleveland.  
 Brown Hoisting & Conveying Mach. Co.....Cleveland.  
 Chase Machine Co.....Cleveland.  
 Donohue & Co., John T.....Baltimore.  
 Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....New York.  
 Hodge, S. F. & Co.....Detroit.  
 Hyde Windlass Co.....Bath, Me.  
 Lidgerwood Mfg. Co.....New York.  
 McMyler Mfg. Co.....Cleveland.  
 Marine Iron Co.....Bay City.  
 Sprague Electric Co.....New York.  
 Westinghouse Electric & Mfg. Co.....Pittsburg.

**INDICATORS FOR STEAM ENGINES.**

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Crosby Steam Gage & Valve Co.....Boston.

**INJECTORS.**

Jenkins Bros.....New York.  
 Penberthy Injector Co.....Detroit.

**INSURANCE, MARINE.**

Brown & Co.....Buffalo.  
 Drake & Maytham.....Buffalo.  
 Elphicke, C. W. & Co.....Chicago.  
 Gibbs & Joys.....Milwaukee.  
 Hawgood & Moore.....Cleveland.  
 Helm, D. T. & Co.....Duluth, Minn.  
 Hutchinson & Co.....Cleveland.  
 Keith, J. G. & Co.....Chicago.  
 La Salle & Co.....Duluth.  
 Mitchell & Co.....Cleveland.  
 Myers, James A.....Chicago.  
 Osborn & Co., F. H.....Chicago.  
 Pauly, H. J.....Milwaukee.  
 Parker & Millen.....Detroit.  
 Peck, Chas. E. & W. F.....New York and Chicago.  
 Richardson, W. C.....Cleveland.

**IRON ORE AND PIG IRON.**

Bourne-Fuller Co.....Cleveland.  
 Hanna, M. A. & Co.....Cleveland.  
 Pickands, Mather & Co.....Cleveland.

**LATHES OF ALL KINDS.**

American Tool Works Co. (The).....Cincinnati.  
 Bement, Miles & Co.....Philadelphia.

**LAUNCHES—NAPHTHA, ELECTRIC.**

Electric Boat Co.....New York.  
 Gas Engine & Power Co.....New York.

**LIFE BOATS—METALLIC.**

Dreln, Thos. & Son.....Wilmington, Del.  
 Kahnweiler's Sons, D.....New York.

**LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.**

Armstrong Cork Co.....Pittsburg.  
 Dreln, Thos. & Son.....Wilmington, Del.  
 Kahnweiler's Sons, D.....New York.  
 Lane & DeGroot.....Brooklyn.

**LIGHTS, SIDE AND SIGNAL.**

Page Bros. & Co.....Boston.

**LUBRICATING PUMPS.**

Manzel Bros.....Buffalo.  
 Phenix Metallic Packing Co.....Chicago.  
 Sterling Lubricator Co.....Rochester, N. Y.

**MACHINE TOOLS.**

American Tool Works Co. (The).....Cincinnati.  
 Bement, Miles & Co.....Philadelphia.

**MACHINE TOOLS (WOOD WORKING).**

Egan Co., The.....Cincinnati.  
 Fay, J. A. & Co.....Cincinnati.  
 Woods Machine Co., S. A.....So. Boston.

**MATTRESSES, CUSHIONS, BEDDING.**

Fogg, M. W.....New York.  
 Mechanical Fabric Co.....Providence, R. I.

**METALLIC PACKING.**

Katzenstein, L. & Co.....New York.  
 Phenix Metallic Packing Co.....Chicago.  
 U. S. Metallic Packing Co.....Philadelphia.

**METALS FOR BEARINGS.**

Cramp, Wm. & Sons.....Philadelphia.  
 Illinois Smelting & Refining Works.....Chicago.  
 Magnolia Metal Co.....New York.  
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

**METAL POLISH.**

Bertram's Oil Polish Co.....Boston, Mass.

**MILLING MACHINES OF ALL KINDS.**

American Tool Works Co. (The).....Cincinnati.  
 Bement, Miles & Co.....Philadelphia.

**NAUTICAL INSTRUMENTS.**

Bliss, John & Co.....New York.  
 Ritchie & Sons, E. S.....Brookline, Mass.

**NAVAL ARCHITECTS.**

Curr, Robert.....Cleveland.  
 Hillman, Gustav.....Brooklyn.  
 See, Horace.....New York.  
 Wood, W. J.....Chicago.

**NICKEL STEEL FORGINGS.**

Bethlehem Steel Co.....So. Bethlehem, Pa.

**OILS AND LUBRICANTS.**

Dixon Crucible Co., Jos.....Jersey City, N. J.  
 Standard Oil Co.....Cleveland.

**PACKING.**

Jenkins Bros.....New York.  
 Katzenstein, L. & Co.....New York.  
 Phenix Metallic Packing Co.....Chicago.  
 U. S. Metallic Packing Co.....Philadelphia.

**PAINTS.**

Baker, Howard H. & Co.....Buffalo.  
 Smith, Edward & Co.....New York.  
 Upson-Walton Co.....Cleveland.

**PAINTING MACHINES, PNEUMATIC.**

Chicago Pneumatic Tool Co.....Chicago.

**PATENT ATTORNEYS.**

Thurston & Bates.....Cleveland.

**PATTERN SHOP MACHINERY.**

Egan Co., The.....Cincinnati.  
 Fay, J. A. & Co.....Cincinnati.  
 Woods Machine Co., S. A.....So. Boston.

**PIPE, WROUGHT IRON.**

Bourne-Fuller Co.....Cleveland

**PLANERS OF ALL KINDS.**

American Tool Works Co. (The).....Cincinnati.  
 Bement, Miles & Co.....Philadelphia.

**PLANING MILL MACHINERY.**

Egan Co., The.....Cincinnati.  
 Fay, J. A. & Co.....Cincinnati.  
 Woods Machine Co., S. A.....So. Boston.

**PLUMBING, MARINE.**

Ellis Marine Plumbing Co.....New York.  
 Mott Iron Works, J. L.....New York.  
 Sands, Alfred B. & Son.....New York.  
 Kenney, The Co.....New York.

**PNEUMATIC TOOLS.**

Chicago Pneumatic Tool Co.....Chicago.  
 Philadelphia Pneumatic Tool Co.....Philadelphia.  
 Standard Pneumatic Tool Co.....Chicago.

**POLISH FOR METALS.**

Bertram's Oil Polish Co.....Boston, Mass.

**PROPELLER WHEELS.**

American Ship Building Co.....Cleveland.  
 Atlantic Works.....East Boston, Mass.  
 Bath Iron Works Ltd.....Bath, Me.  
 Case, A. Wells & Son.....Highland Park, Conn.  
 Cramp, Wm. & Sons.....Philadelphia.  
 Detroit Shipbuilding Co.....Detroit.  
 Farrar & Trefts.....Buffalo.  
 Fore River Engine Co.....Weymouth, Mass.  
 Hardy, John B.....Tacoma, Wash.  
 Hyde Windlass Co.....Bath, Me.  
 Harlan & Hollingsworth Co.....Wilmington, Del.  
 Hodge, S. F. & Co.....Detroit.  
 Jenks Ship Building Co.....Port Huron, Mich.  
 MacKinnon Mfg Co.....Bay City, Mich.  
 Maryland Steel Co.....Sparrow's Point, Md.  
 Moran Bros. Co.....Seattle, Wash.  
 Morse Iron Works & Dry Dock Co.....Brooklyn.  
 Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.  
 Newport News Ship Bldg. Co.....Newport News, Va.  
 Nixon, Lewis.....Elizabeth, N. J.  
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.  
 Pusey & Jones Co.....Wilmington, Del.  
 Risdon Iron Works.....San Francisco.  
 Sheriffs Mfg. Co.....Milwaukee.  
 Trigg, Wm. R. Co.....Richmond, Va.  
 Trout, H. G.....Buffalo.  
 Union Iron Works.....San Francisco.  
 Wolff & Zwicker Iron Works.....Portland, Ore.

**PROJECTORS, ELECTRIC.**

Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....Schenectady, N. Y.  
 Rushmore Dynamo Works.....Jersey City, N. J.  
 Sprague Electric Co.....New York.  
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

**PUMPS FOR VARIOUS PURPOSES.**

Blake, Geo. F. Mfg. Co.....New York.  
 Davidson, M. T.....Brooklyn, N. Y.  
 Donohue & Co., John T.....Baltimore.  
 Kingsford Foundry & Machine Works.....  
 ..... Oswego, N. Y.  
 Van Duzen, The E. W. Co.....Cincinnati.  
 Worthington, Henry R.....New York.

**PUNCHES, RIVETERS, SHEARS.**

American Tool Works Co. (The).....Cincinnati.  
 Bement, Miles & Co.....Philadelphia.  
 Cleveland Punch & Shear Works Co.....Cleveland.  
 Long & Allstatter Co.....Cincinnati.  
 New Doty Mfg. Co.....Janesville, Wis.  
 Wood & Co., R. D.....Philadelphia.

**RANGES, KITCHEN OUTFITS.**

Born Steel Range & Mfg. Co.....Cleveland.

**REGISTER FOR CLASSIFICATION OF VESSELS.**

Great Lakes Register.....Cleveland.

**RELEASING HOOKS FOR DETACHING BOATS.**

Standard Aut. Releasing Hook Co.....New York.

**RIVETS, STEEL, FOR SHIPS AND BOILERS.**

Bourne-Fuller Co.....Cleveland.  
 Champion Rivet Co.....Cleveland.

**RUBBER INSULATED WIRES.**

Roebbing's Sons, John A.....New York and Cleveland.

**SAFETY VALVES.**

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Crosby Steam Gage & Valve Co.....Boston.

**SAIL MAKERS.**

Baker, Howard H. & Co.....Buffalo.  
 Upson-Walton Co.....Cleveland.  
 Wilson & Silsby.....Boston.

**SALVAGE COMPANIES.**

See wrecking companies.

**SCREW MACHINES.**

American Tool Works Co. (The).....Cincinnati.  
 Bement, Miles & Co.....Philadelphia.

**SEARCH LIGHTS.**

Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....Schenectady, N. Y.  
 Rushmore Dynamo Works.....Jersey City, N. J.  
 Sprague Electric Co.....New York.  
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

**SEPARATORS, (CENTRIFUGAL).**

Keystone Engine & Machine Works, W. L. Simpson,  
 Engineer.....Philadelphia.

**SHAPERS.**

American Tool Works Co. (The).....Cincinnati.

**SHEARS.**

See punches, riveters and shears.

**SHIP AND BOILER PLATES AND SHAPES.**

Bourne-Fuller Co.....Cleveland.

**SHIP BUILDERS.**

American Ship Building Co.....Cleveland.  
 Atlantic Works.....East Boston, Mass.  
 Bath Iron Works, Ltd.....Bath, Me.  
 Buffalo Dry Dock Co.....Buffalo.  
 Cramp, Wm. & Sons.....Philadelphia.  
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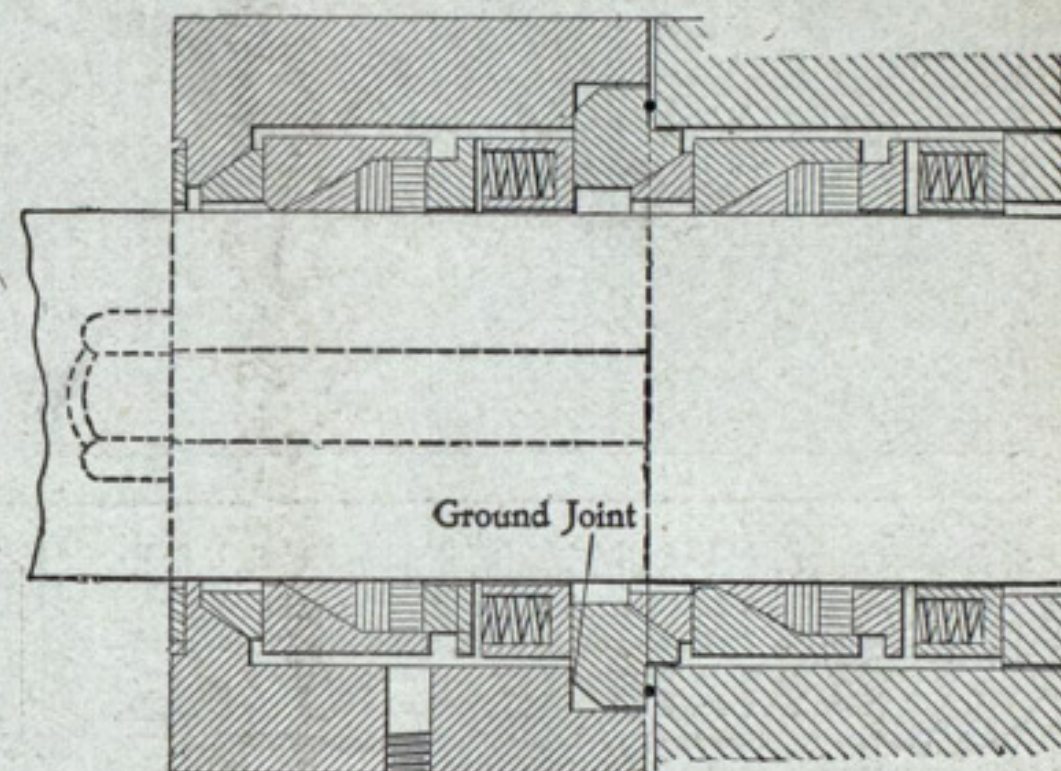
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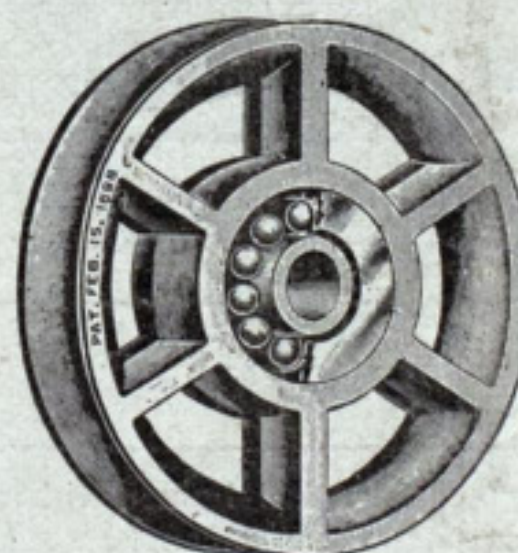
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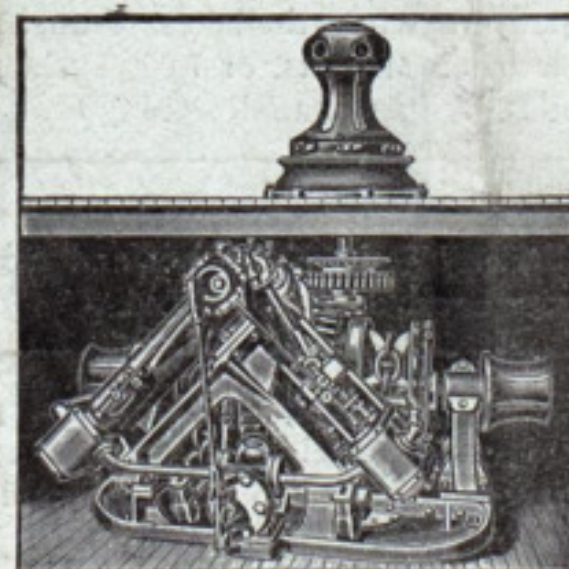
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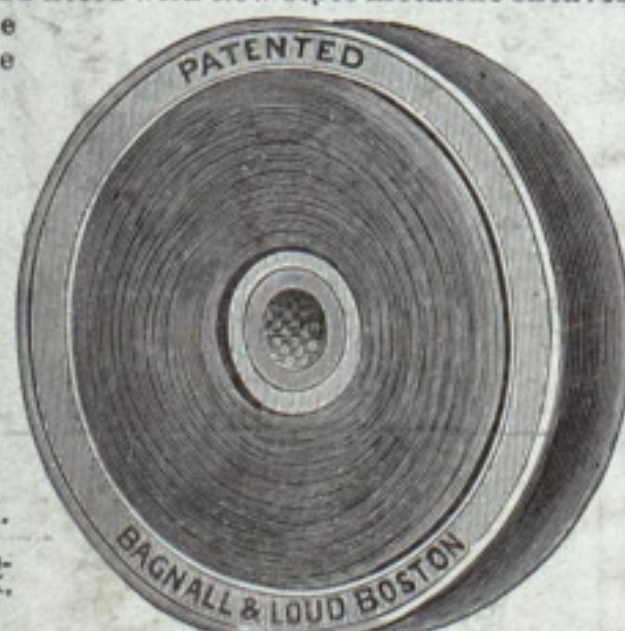
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No. 21.



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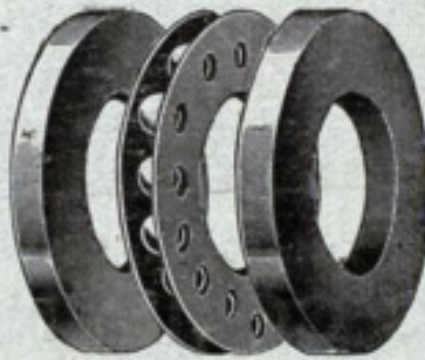
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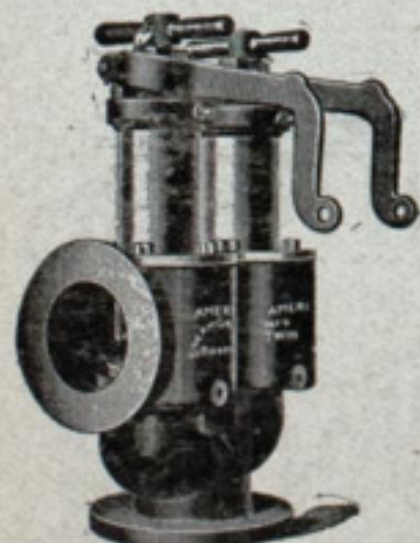
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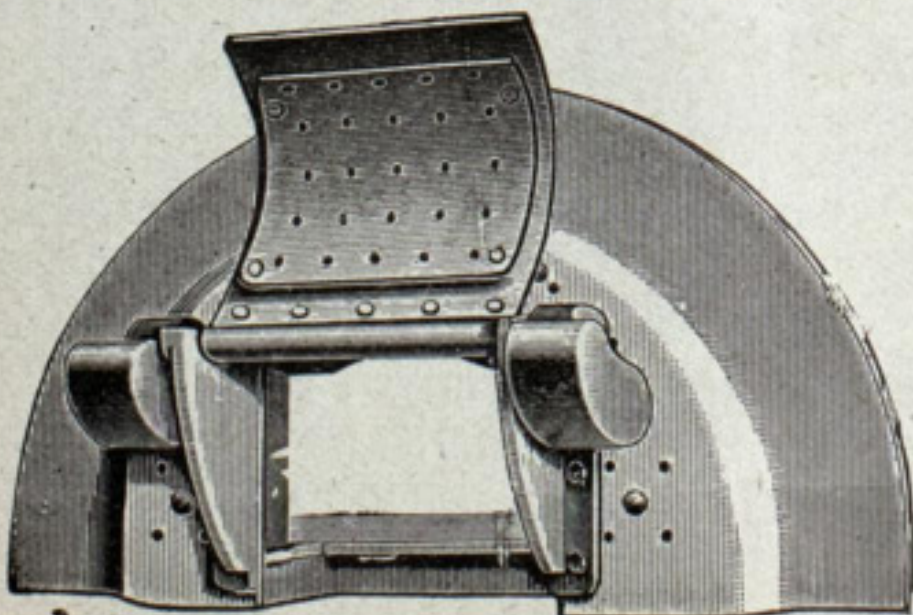
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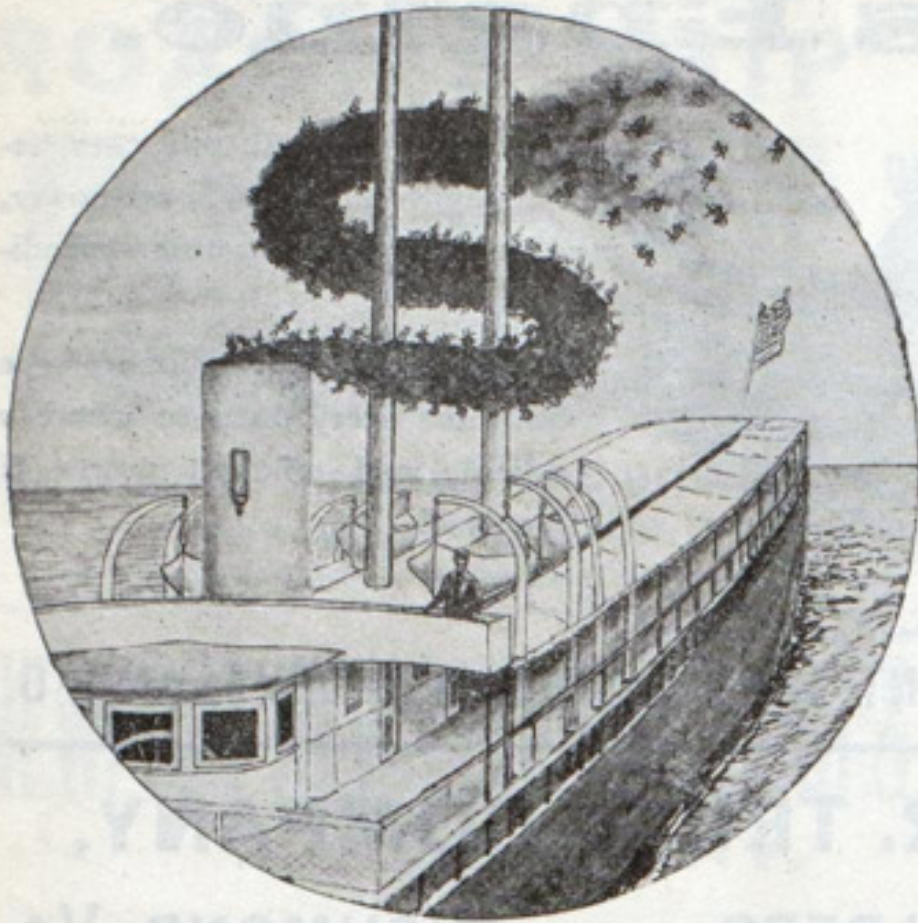
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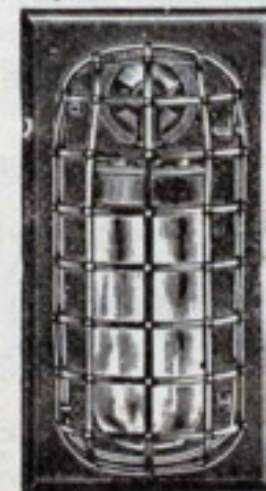
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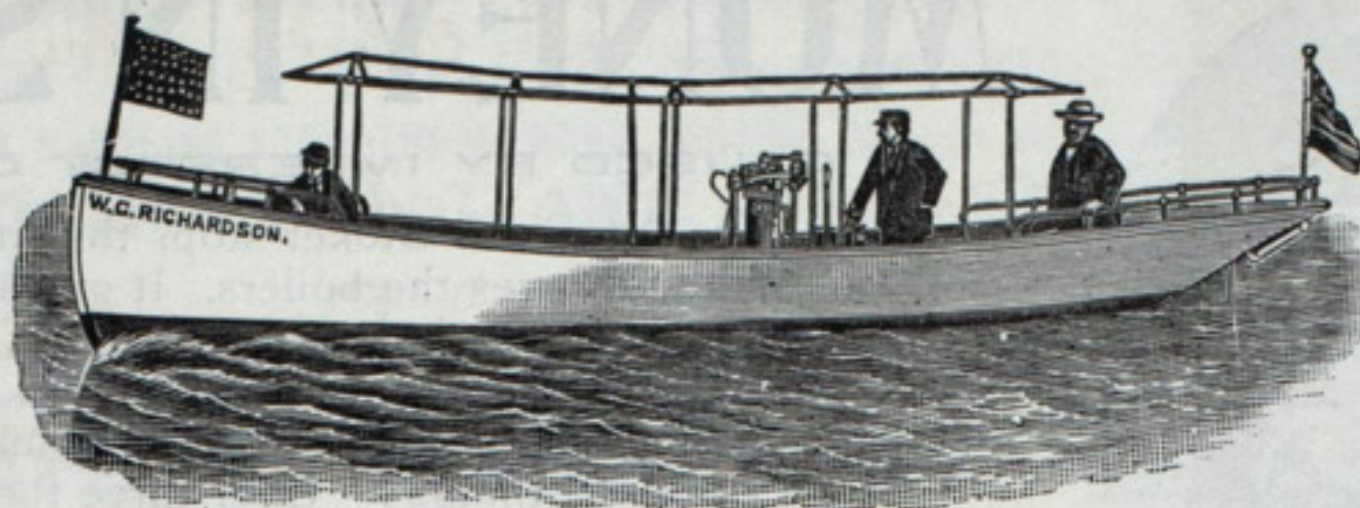


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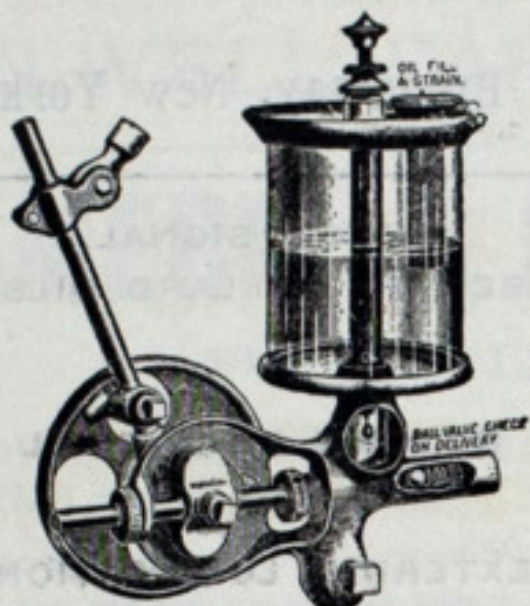


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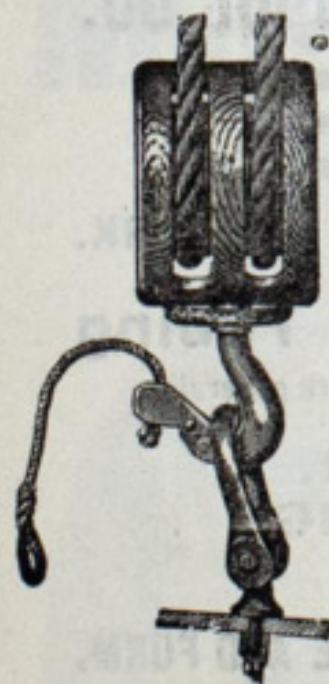
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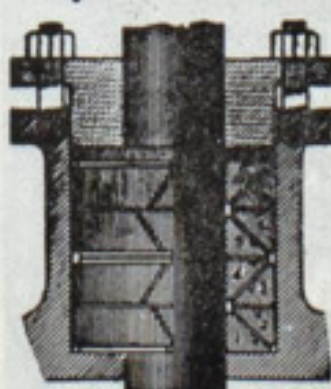
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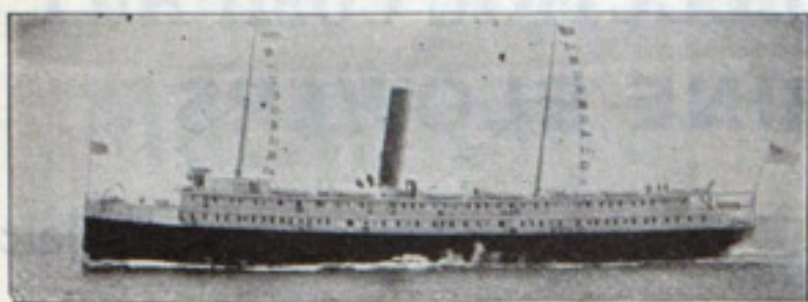
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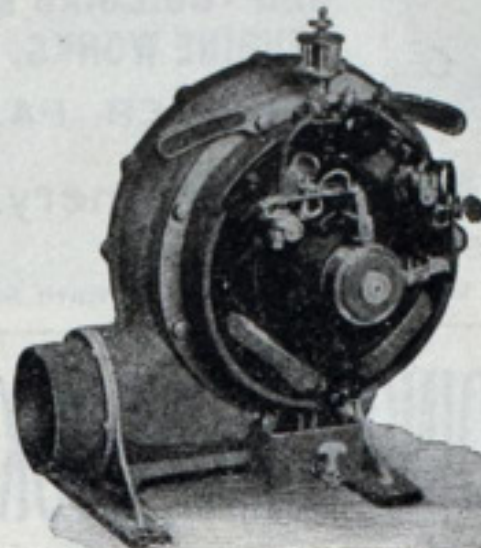
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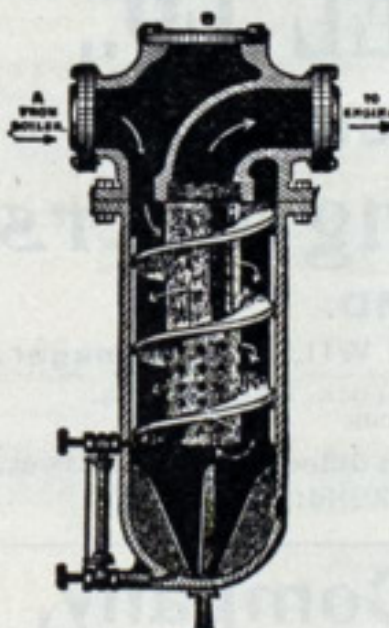
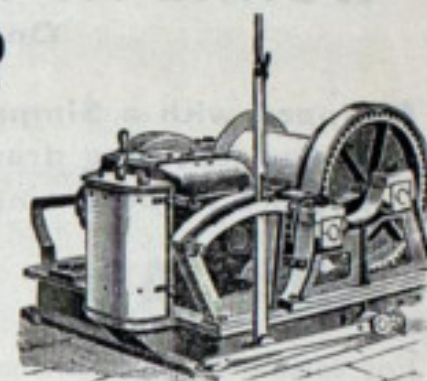
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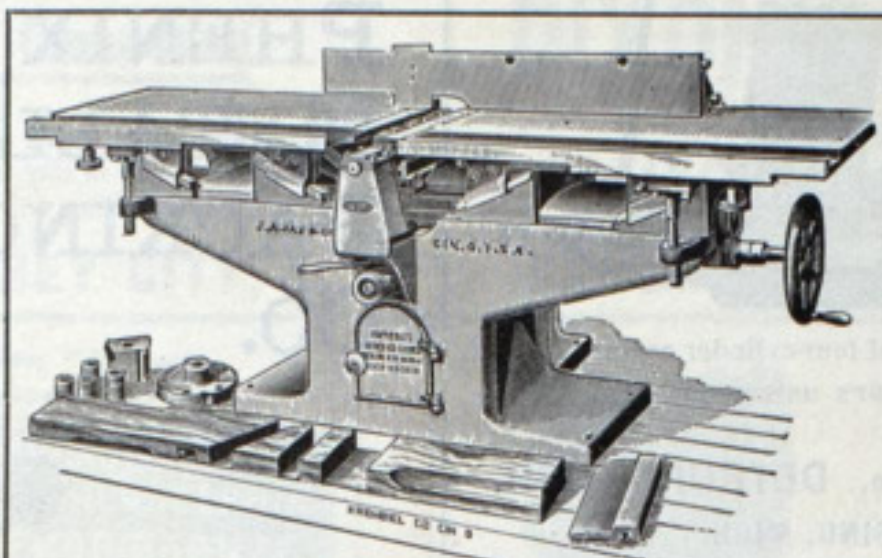


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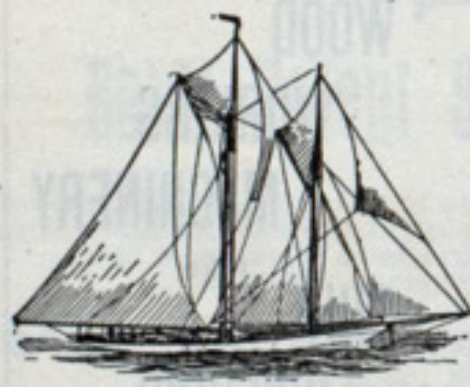
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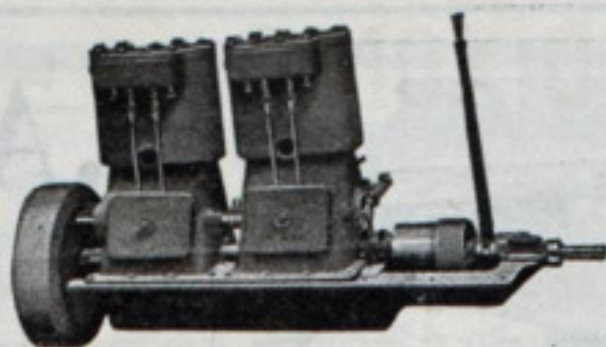
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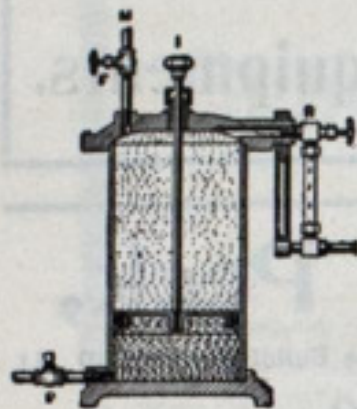
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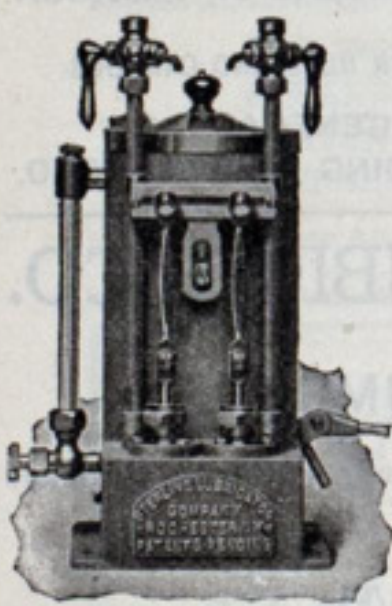
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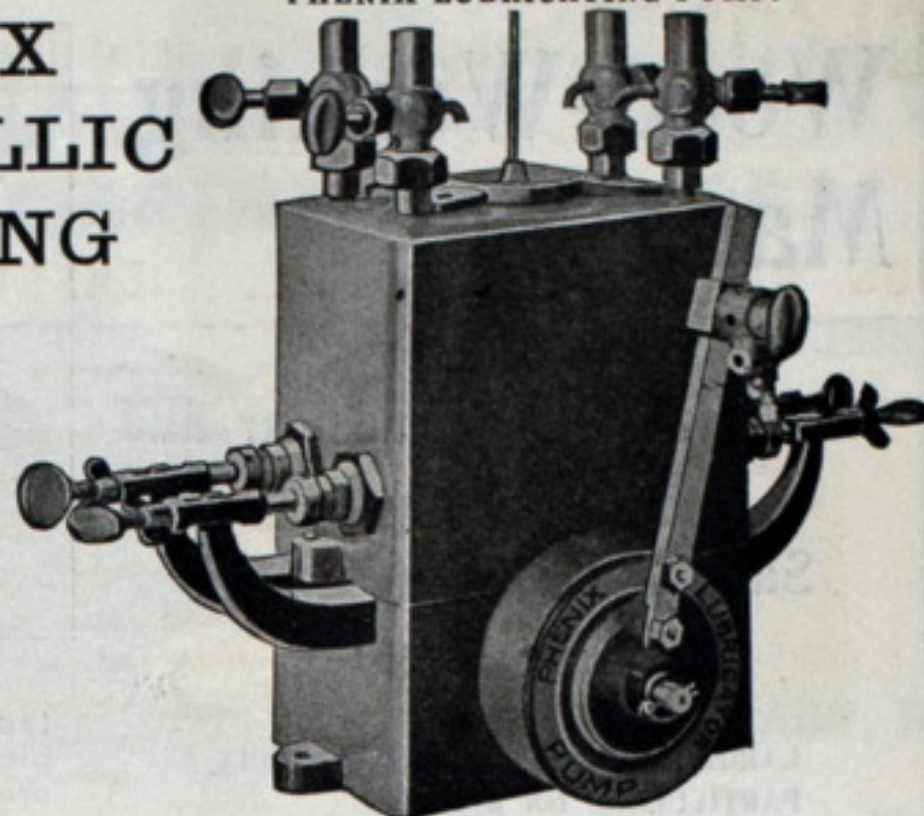
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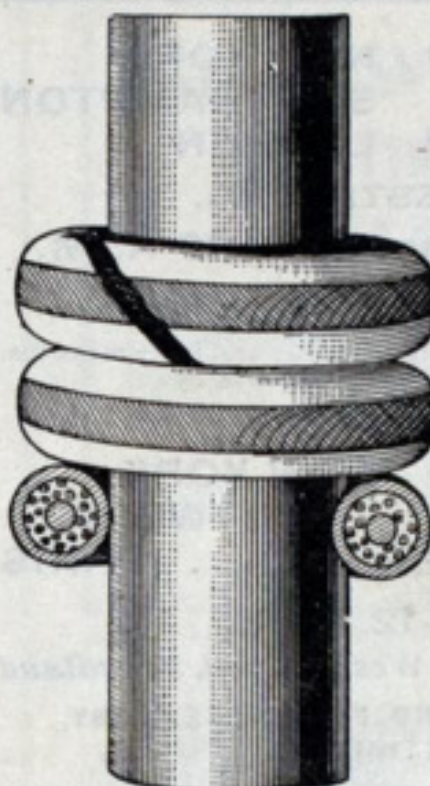
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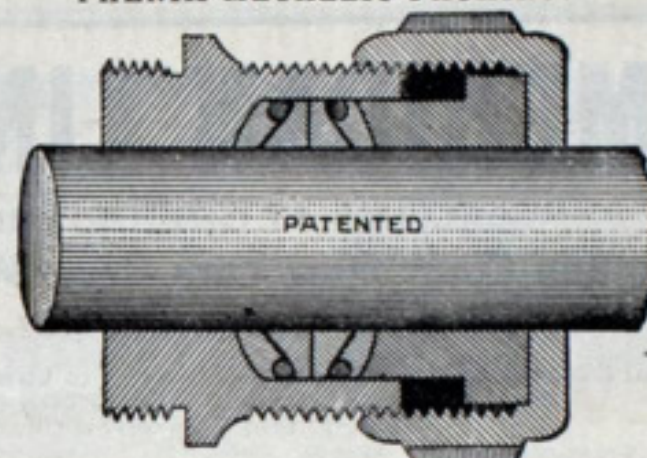
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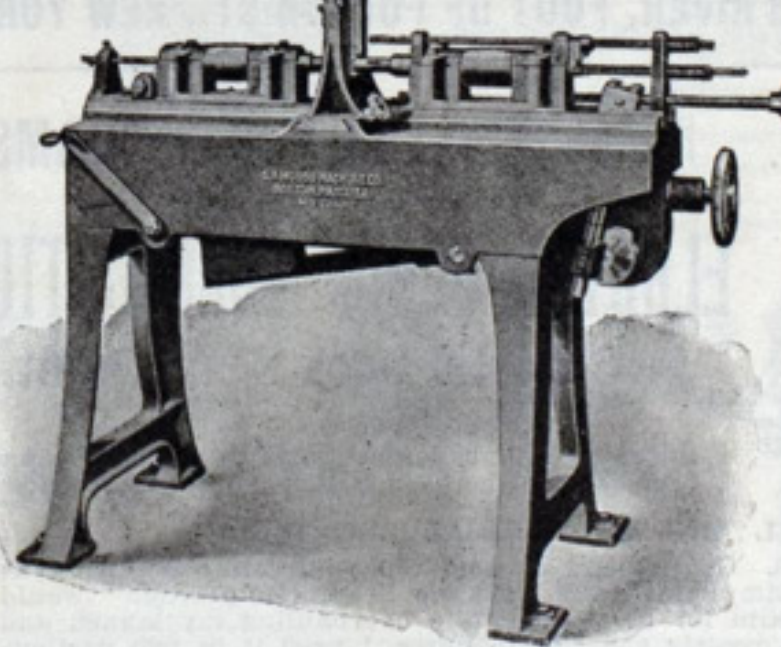
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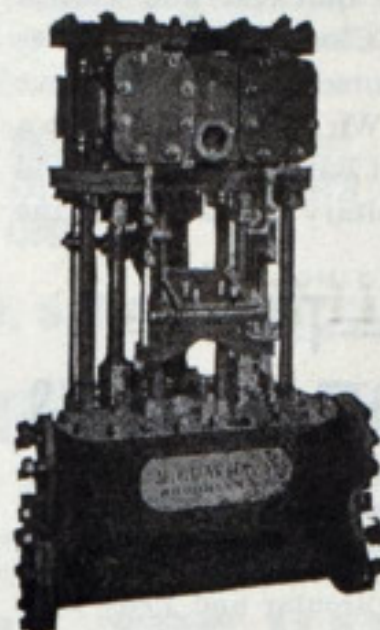
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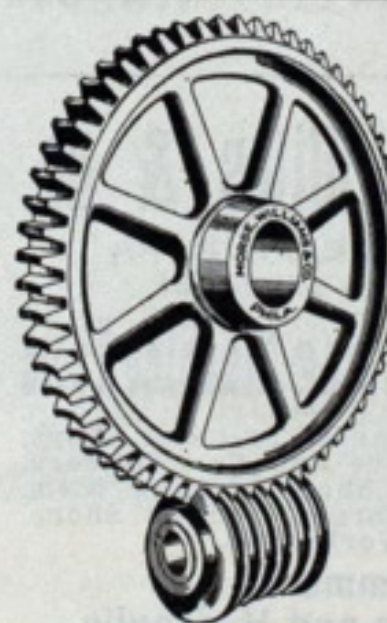
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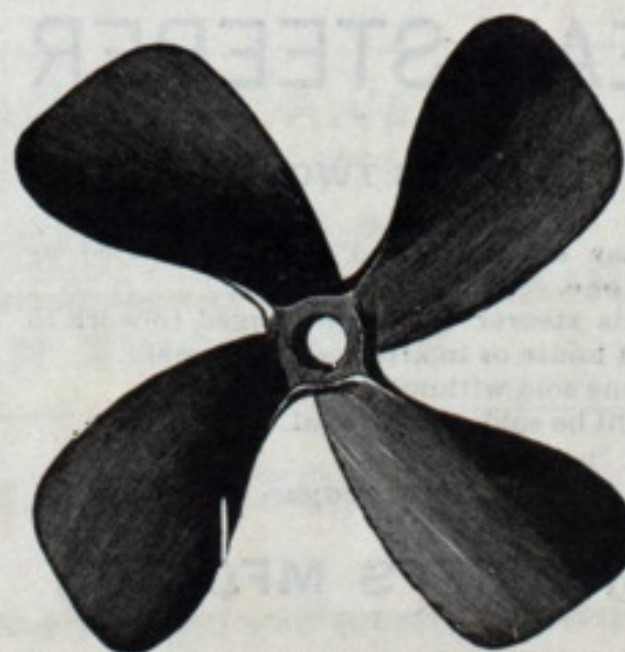
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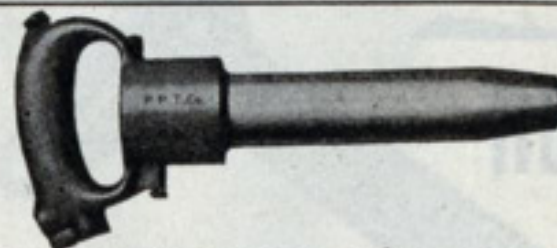
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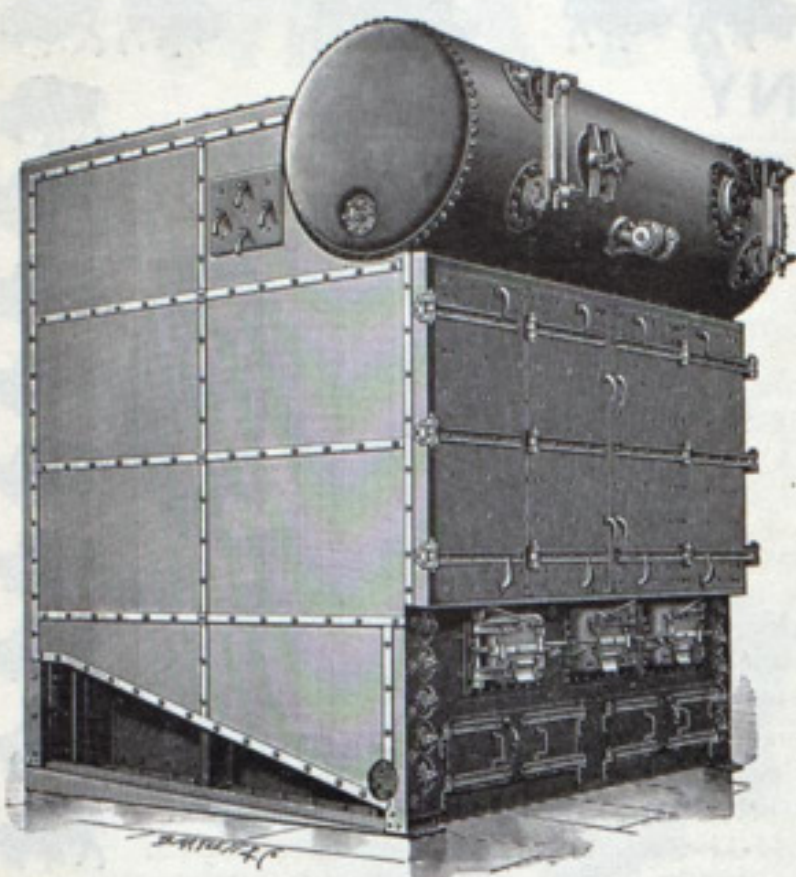
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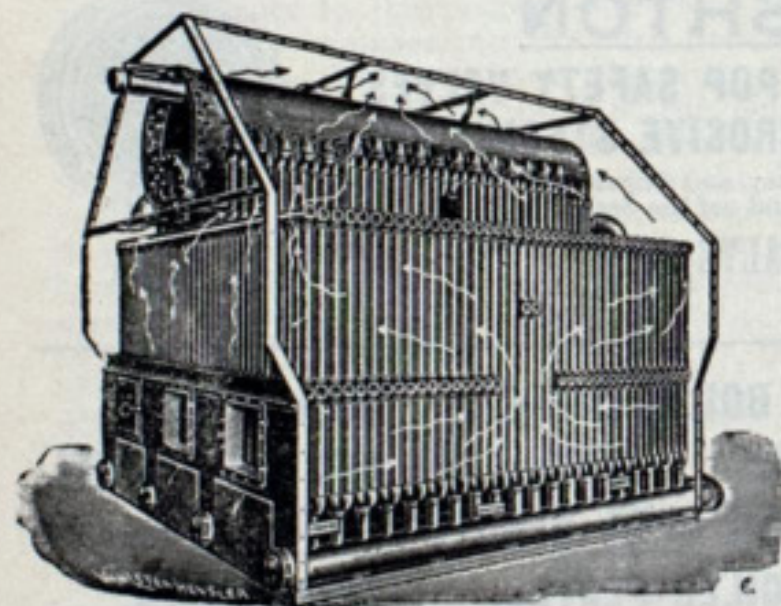
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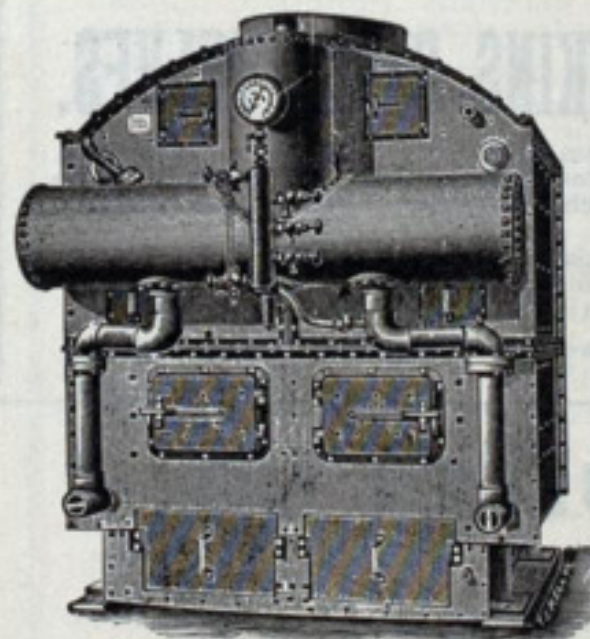
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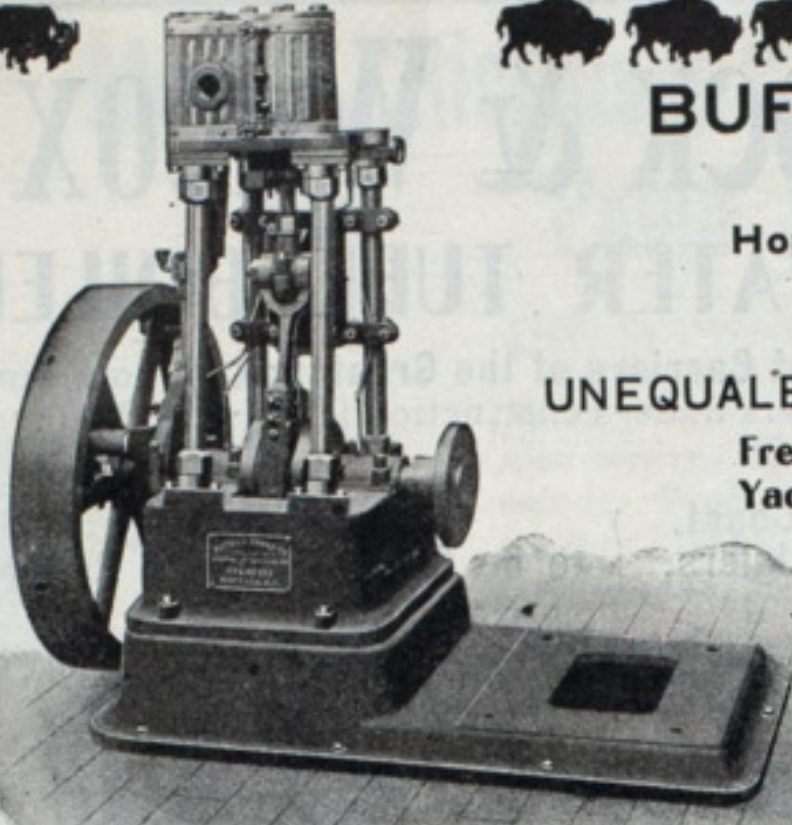
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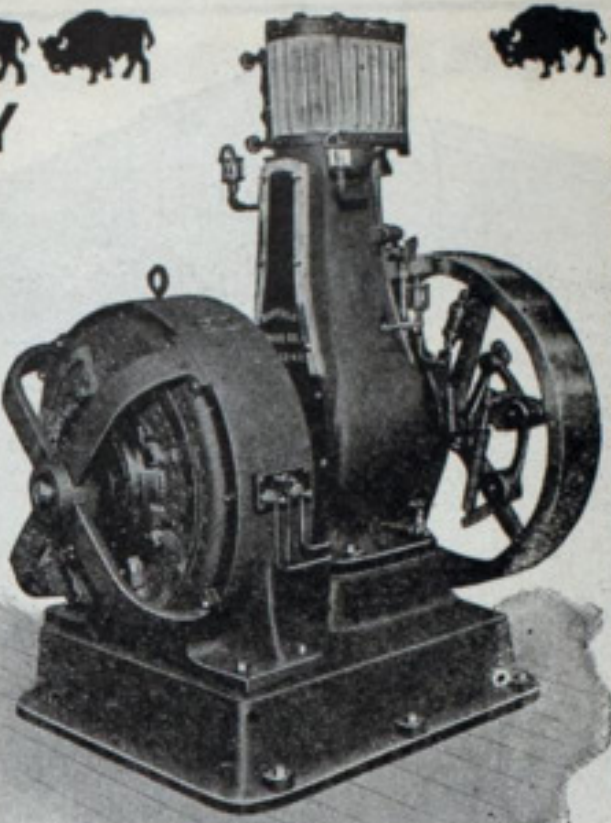
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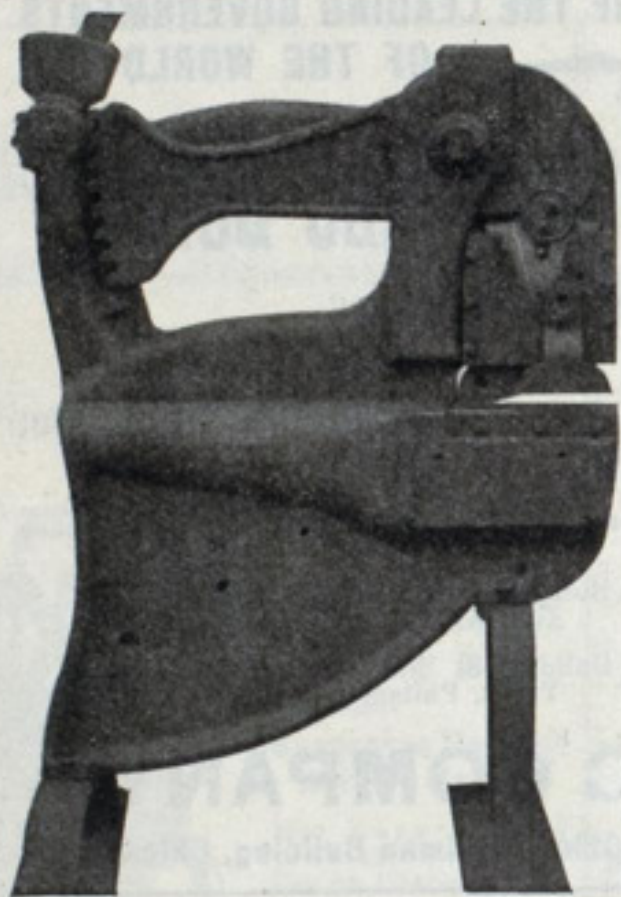


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